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The Gift of Fra[illegible]is Willoughby
His Son Digby Willoughby.
lesley Jolly 1784.

Degrees,
Latitude North 53.30
st Longitude from London .. 1. 3

The Naviga[illegible]'s
Assistant,
Containing
The Theory & Practice
of Navigation by
Wm Nicholson 1784.

Digby Willoughby's Book, 1785.

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THE

NAVIGATOR'S ASSISTANT;

CONTAINING

THE THEORY AND PRACTICE

OF

NAVIGATION,

WITH ALL THE

TABLES

REQUISITE FOR DETERMINING A SHIP'S PLACE AT SEA.

BY WILLIAM NICHOLSON.

LONDON:
PRINTED FOR T. LONGMAN, PATERNOSTER-ROW; T. CADELL, STRAND; AND J. SEWELL, CORNHILL.
M. DCC. LXXXIV.

PREFACE.

IT is a [illegible] for Authors to [illegible] of prefaces to the [illegible] their ſhort compoſitions [illegible] correſponds with the variety [illegible] produced them. The [illegible] the man of conſcious [illegible] vanity ſupported him [illegible] in the awful preſence [illegible] in purſuit of the ſame [illegible]. It is a matter of [illegible] to aſcertain which of theſe [illegible] the minds of the preſent [illegible] by hope or fear, [illegible] that can attend [illegible] tory book [illegible] with the intention [illegible] extenſively uſeful [illegible] give to a virtuous mind [illegible] it to be unneceſſary [illegible] to obtrude on the eye of the publick [illegible] conſtructed hints concerning [illegible] with which prefaces are uſually filled. The importance of his ſubject is univerſally acknowledged: it remains only to mention in this place the method he has taken to explain its principles and [illegible]

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Galloways
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PREFACE.

5-24-47 ADE

IT is a rational and eſtabliſhed cuſtom for Authors to addreſs the Public by way of preface to the performances they exhibit. In theſe ſhort compoſitions we ſee a variety that correſponds with the variety of diſpoſitions that produced them. The timid, the arrogant, the man of conſcious merit, and the man whoſe vanity ſupported him in the cloſet, but ſhrinks in the awful preſence of his judges, are here ſeen in purſuit of the ſame object, Approbation. It is a matter of very little conſequence to aſcertain which of theſe characters is adapted to the author of the preſent treatiſe. Not much agitated either by hope or fear, he regards the utmoſt applauſe that can attend the compoſition of an introductory book as a thing of ſmall value, compared with the internal reward which the deſire of being extenſively uſeful to the community, cannot but give to a virtuous mind. He therefore preſumes it to be unneceſſary, as well as indecent, to obtrude on the eye of the public, any of thoſe finely conſtructed hints concerning merit, with which prefaces are uſually filled. The importance of his ſubject is univerſally acknowledged: it remains only to mention in this place the method he has taken to explain its principles and practice.

The only book, in the Engliſh Language, that is ſtrictly ſcientific and dependant in its parts throughout, is Robertſon's Elements of Navigation. A work highly eſteemed, and deſerving the eſtimation it has met with. If this book had been as well calculated for the general purpoſes of ſeamen, as it is for the academical teaching of the ſcience of Navigation, the preſent Treatiſe would never have been written. But it is too expenſive for common purchaſers, and too voluminous for daily uſe. The diſperſion of the tables and of the practical matter, renders them difficult to be readily come at, and the ſhort radius of the traverſe table prevents its extending at ſight to the uſual diſtance of a day's run. Theſe and other ſimilar objections are not offered as affecting the merits of the excellent book we ſpeak of. They are trifling when conſidered in that light; though of ſufficient conſequence in their effects to render a ſmaller work deſirable.

It is true, that ſmaller works on the ſubject have long been extant. But in theſe, inſtead of taking every advantage to employ their ſcanty limits in the proper demonſtration of the elements of practical navigation, their authors have either crouded them with problems of very remote utility, or leſſons reſpecting ſeamanſhip, an art which can never be acquired by any other means than actual practice at ſea. It may readily be imagined, that the admiſſion of theſe matters muſt occaſion the other parts to be ſhortened: and there is a limit beyond which ſcience cannot be ſhortened without curtailing ſome of its proofs.

To obtain this limit it was neceſſary to conſider the ſubject in a retrograde manner; that is to ſay, for inſtance, it appears from the contemplation of the elements that enter into a day's work, that ſpherical trigonometry is only wanted in the computation of azimuths and amplitudes, for which reaſon it does not ſeem neceſſary in a compendious work to burthen the generality of purchaſers, with the whole of ſpherical trigonometry which would be required for the demonſtration of theſe problems. And however deſireable it may be, that every navigator ſhould fundamentally underſtand the principles of the art he practiſes, yet it is certain, that the majority will not acquire that knowledge. For theſe and other reaſons that will offer themſelves to the intelligent reader, and particularly that room might be left to treat more perſpicuouſly concerning the other eſſential matter, it was thought expedient to omit the doctrine of ſpherical triangles. By this omiſſion the contents of the work are reduced to the arithmetic neceſſary for underſtanding the nature of proportional numbers and logarithms; the geometry and coſmography required for deducing the ſeveral methods of ſailing with their dependancies; and the diſplay or exemplification of thoſe methods. In theſe likewiſe the intended conciſeneſs was aſcertained by the ſame retrograde manner of contemplating the ſeveral parts of the ſubject.

The great difficulty, and perhaps impoſſibility, of treating proportional quantities with accuracy, in any other method than that of Euclid, made it neceſſary in this book to ſpeak only of the proportions of commenſurables of like kinds or quantities expreſſible by number; care being taken not to miſlead the reader, or vitiate his taſte reſpecting this important part of mathematical ſcience, by permitting him to imagine, that what is here ſaid is ſufficient to convey a general and complete knowledge of the ſubject. The geometrical ſection is very ſhort; containing little more than the common properties of parallel right lines, and the doctrine of the proportionality of the ſides of ſimilar right lined triangles. This ſection is rendered more conciſe by a liberal uſe of the congruity of figures. Few will be inclined to deny the admiſſibility of this method of proof, when they reflect that * congruity is the thing, to which almoſt every argumentation, reſpecting quantity, is ultimately directed, and that conſequently its exiſtence is the principal metaphyſical hypotheſis on which the ſciences that reſpect quantity are founded. However, it muſt be confeſſed, that Euclid has very ſparingly availed himſelf of its uſe, perhaps becauſe its effect in ſome meaſure reſembles that which would ariſe from increaſing the number of axioms; but this reaſon does not ſeem ſufficient to demand the like caution in the writer of a compendium. It will likewiſe be ſeen, that Theo. 8. of the ſame ſection, is demonſtrated neither in ſo ſhort, nor ſo elegant a manner as that of Euclid †, though conciſeneſs is the only reaſon for adopting it, ſince it does not require the previous eſtabliſhment of ſo great a number of theorems as the other demands.

The third Section of the firſt Book contains the theory and practice of plane trigonometry. This is followed by a ſection upon Coſmography, in

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* See Barrow's XIth Mathematical Lecture.

† Book VI. Prop. 2.

in which the figure and motions of the earth and other planets, and their conſequences, particularly the tides and winds are explained. In this place likewiſe, rather than any other, accounts of the inſtruments uſed to meaſure angles, and inſtructions for making the obſervations requiſite for determining the latitude, longitude, and variation of the compaſs, appeared to demand inſertion. Excepting only, the methods of finding the latitude from two altitudes of the ſun and the intermediate time, and longitude from the angular diſtance between the moon and the ſun or a fixed ſtar; which not being eſteemed indiſpenſable requiſites for keeping a journal of a ſhip's way, and being beſides independent of the principles laid down in the work itſelf, are thrown into two ſeparate chapters, by way of appendix.

In the ſecond Book, after teaching the principles of plane, parallel, middle latitude, and mercator's ſailing, the method of keeping a journal at ſea is laid down by a ſett, conſiſting of twelve precepts. There are many ſeamen who have never had a proper opportunity, or leiſure, to acquire a ſcientific knowledge of navigation, and yet would be glad to keep a journal. Theſe ought not to be diſcouraged; and it is particularly with an eye to their wants, that the precepts are drawn up in ſuch a manner, that they ſuppoſe no previous acquaintance in the reader with the other parts of navigation laid down in the foregoing pages of the treatiſe. And experience juſtifies the aſſertion, that any one who, with common attention and induſtry, will apply them to the day's works af the journal that follows, may, without farther aſſiſtance, in a few days, acquire the method of keeping a reckoning. The Journal is ſo conſtructed, that without offence to probability, it contains every variety of winds and weather, and conſequently of ſailing, that can happen.

The Journal is followed by a chapter on Surveying of Harbours. This important, though too much neglected branch of nautical knowledge, is treated in a manner which, it is hoped, will make its acquiſition and practice perfectly eaſy. With this intention the requiſite inſtructions are not only arranged in order, but the precepts are minutely illuſtrated by a drawing, and particular references for every part of the proceſs.

The method of finding the Latitude from the two altitudes of the Sun and the intermediate time, has met with great approbation from the maritime world. It is in many caſes uſeful, but in none more ſo than near the chops of the Channel, when a knowledge of the latitude is of great conſequence, and the meridional obſervations are often prevented for ſeven or eight days by cloſe weather.

One of the principal advantages which the world has derived from the liberality of the Britiſh Government, in encouraging the attempts of ingenious men towards diſcovering the longitude at ſea, is derived from the perfection to which the theory of the moon's motion has been carried. The Commiſſioners of longitude has been indefatigable in advancing the facility, and obviating the errors of the method of finding the longitude by the help of obſervations of the angular diſtance between the moon and the ſun, or a fixed ſtar. A book of the nature of the preſent might be thought eſſentially improper, if it did not contain inſtructions for the ſolution of this problem. A Chapter is therefore added to explain one of the methods, which has the advantage of being practicable on Gunter's Scale, and is ſufficiently exact in all caſes where the moon's parallax in altitude is not extremely great, and the diſtance at the ſame time very ſmall.

The extenſive collection of Tables which follows, has been corrected with great care, as well by compariſon with other tables, as by the ſucceſſive application of the differences.

London, December 24, 1783.

4B.

" Examine, & Understand, that Survey of
Spurn Head which Mr. Harrison
Sent you a present: it's an excellent plan,
for the new Light Houses, at the entrance
of the Humber.

Publiſhed by the Author of this Work,

An INTRODUCTION to NATURAL PHILOSOPHY.

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ERRATA.

ERRATA.

Page 54, line 2, from bottom, for *Series*, read *Sines*. P. 88, l. 15, from bottom, for K, read A. P. 102, l. 18, for *altitude*, read *latitude*. P. 107, l. 19, for *aparture*, read *aperture*. P. 143, l. 13, dele the comma after *ſo*, and inſert a comma after *provided*. P. 171, l. 20, for *Towards*, read *Forwards*.

THE

NAVIGATOR'S ASSISTANT.

BOOK I.

SECT. I. OF ARITHMETIC.

CHAP. I.

DECIMAL ARITHMETIC.

ON account of the imperfection of our memory, it is evidently impracticable in numbering, to have a different ſimple term for every number. For this reaſon it is found neceſſary, after the enumeration of a certain number of units, to begin again as it were, and count forward an equal number, which is ſuppoſed to be joined to the former, and ſo forth. This number, thus repeatedly added to itſelf, is arbitrary, and may be a dozen, a ſcore, ten, or any other number. But the whole world at preſent has adopted the repetition of the number ten, ſo that we have few veſtiges of any other numeration remaining. Thoſe for whom this book is intended, cannot be ſo uninſtructed as not to know, that we begin and count from one to nine, diſtinguiſhing every number in ſucceſſion by a different name and character; and that ten being conſidered as an unit of a larger kind, is denoted by the ſame character as one, but placed for diſtinction, to the left hand of a cypher in the original unit's place. In like manner, the tens are enumerated till they conſtitute a ſtill larger unit, called one hundred, &c. &c. Such is the method by which we can count and write down the largeſt numbers with eaſe and conciſeneſs.

Now ſince the diviſibility of quantity is without limit, it is plain that we may ſuppoſe a given unit or magnitude to conſiſt of ten, one hundred, one thouſand, &c. parts at pleaſure, and may conſequently denote any part of the unit by expreſſing the number of tenth, hundreth or thouſandth parts contained in the ſaid part. And this manner of dividing the unit is attended with a peculiar advantage, *viz.* that the decimal parts may be arranged in the ſame line with any whole number to which they are joined, and may be added, ſubtracted, multiplied, and divided, without that previous reduction which is commonly required in managing vulgar fractions.

Decimal fractions are ſeparated from whole numbers, or if alone are denoted, by a point or dot prefixed, and their figures rank in value according to their diſtance from the units place, as in whole numbers, excepting that they continually decreaſe in value, accordingly as they are more and more remote. Thus 1.5 is one and five tenths, 1.05 is one and five hundredths, 1.005 is one and five thouſandths; or .5 ſingly is five tenths, .05 is five hundredths, .005 is five thouſandths; the value decimally decreaſing according to the remoteneſs of the figure from the place of units. Here it is obſervable, that a cypher to the left hand, which in whole numbers would ſignify nothing, ſerves in decimals to depreſs the value of the figure, to which it is prefixed, tenfold; and likewiſe that a cypher to the right hand is, on the contrary, of no importance with regard to the value of a decimal. For .500 and .50 and .5 are all equal, being each five tenths.

Another way of reading decimals which anſwers the ſame purpoſe, is to ſuppoſe them to be vulgar fractions, having for a denominator an unit with as many cyphers as there are places in the decimal. Thus .7356 is read either ſeven tenths, three hundredths, five thouſandths, and ſix ten thouſandths; or $\frac{7356}{10000}$ ſeven thouſand three hundred and fifty-ſix ten thouſandth parts. And ſo likewiſe of others.

I. Addition and Subtraction of Decimals are performed as in common arithmetic, care being taken to place the decimal points in a line, ſo that places of the ſame denomination may range beneath each other.

EXAMPLES IN ADDITION.

127.63			
10.079	62.79	86.2479	728.6279
330.7	8.572	70.99	.0004
50.	774.07	642.	30.44
.0627			
518.4717	845.432	799.2379	759.0683

EXAMPLES IN SUBTRACTION.

From	6273.437	From	8562.	From	3845.004
Take	334.54	Take	1007.428	Take	72.
Rem.	5938.897	Rem.	7554.572	Rem.	3773.004

II. Multiplication of Decimals is performed as in common arithmetic. The decimal point muſt be ſo placed, in the product, that the number of figures cut off to the right, may equal the number of decimal places both in the multiplicand and multiplier. But if the product ſhould not conſiſt of ſo many figures as there are decimal places in the two factors, the defect muſt be ſupplied by cyphers placed on the left hand.

EXAMPLES IN MULTIPLICATION.

Multiply	735.86	Multiply	264.8	Multiply	.7326
By	4.5	By	.336	By	.1158
	367930		15888		58608
	294344		7944		36630
	3311.370		7944		7326
			88.9728		7326
					.08483508

III. Diviſion of Decimals is likewiſe performed as in whole numbers, care being taken that the decimal places in the dividend be equal to thoſe in the diviſor and quotient.

For this purpoſe, if the dividend have more decimal figures than the diviſor, the number of figures pointed off in the quotient muſt be made equal to the exceſs in the dividend, a want of places in the quotient being ſupplied with cyphers to the left hand if neceſſary; and if the number of places in the dividend ſhould not be equal to thoſe in the diviſor, the defect muſt be ſupplied with cyphers to the right hand, and the quotient will be a whole number.

EXAMPLES IN DIVISION.

735.86)3311.370(4.5
294344
.367930
367930

.7326).1157508(.0158
7326
42490
36630
.58608
58608

.72)1.000(1.3
72
.280
216
.64

3) 2.00, &c.
.66 &c.

IV. A Vulgar Fraction is reduced to a Decimal of the ſame value, by dividing the numerator by the denominator, according to the foregoing rule.

EXAMPLES.

Required the decimal values of the fractions $\frac{1}{2}$, $\frac{3}{4}$, $\frac{1}{3}$, $\frac{70}{362}$, and $\frac{8}{9}$?

2)1.0
.5

4)3.00
.75

3)1.0 &c.
.33 &c.

362)70.0(.193 &c.
362
3380
3258
.1220
1086
.34

9)8.0 &c.
.888&c.

By this rule it is eaſy to find the decimal value of ſhillings, ounces, yards, or any other quantities, conſidered as fractional parts of larger quantities.

EXAMPLES.

Required the decimal value of 7 *s.* with reſpect to a pound ſterling?

7 *s.* is $\frac{7}{20}$ of a £. therefore 20)7.0
.35 is the decimal.

What decimal part of a mile is 20 feet?

20 feet is $\frac{20}{5280}$ of a mile; therefore 5280)20.000(.00378 &c.

```
15840
------
.41600
 36960
 ------
 .46400
  42240
  ------
  .4160
```

V. The converſe of this, namely to find the quantity of parts of any kind contained in a decimal part of a known quantity, is attended with equal facility: for the decimal may be reduced by multiplication as in common arithmetic.

EXAMPLES.

How many ſhillings, pence and farthings are contained in .934375 *l.* ſterling?

```
 .934375 l.
       20
 ----------
18.687500 s.
       12
 ----------
 8.250000 d.
        4
 ----------
 1.000000     Anſwer 18 s. 8¼ d.
```

EXPLANATION OF SIGNS AND CHARACTERS.

= equal.	The ſign of equality. Thus AB=BC is read, AB is equal to BC.
+ plus or more.	The ſign of addition. Thus 5+4=9, is read, 5 more 4 is equal to 9.
— minus or leſs.	The ſign of ſubtraction. Thus 3—2=1, is read, 3 leſs 2 is equal to 1.
× into or with.	The ſign of multiplication. Thus 2×9=18, is read, 2 into 9 is equal to 18.
÷ by	The ſign of diviſion. Thus 18÷6=3, is read, 18 by 6 is equal to 3. But it is much more uſual to expreſs diviſion by placing the dividend above a ſhort line, and the diviſor underneath it, as $\frac{18}{6}=3$.

CHAP. II.

OF PROPORTION.

I. QUANTITIES, which by augmentation may be made to exceed each other, are ſaid to be of the ſame kind. And quantities of the ſame kind may be compared with reſpect to magnitude.

Thus a line and another line are quantities of the ſame kind, becauſe one of them being augmented, may be made to exceed the other: but a line and a ſuperficies are not quantities of the ſame kind, becauſe no augmentation of the one can make it exceed the other. It is likewiſe evident, that a compariſon with reſpect to magnitude, may ſubſiſt between two lines, but not between a line and a ſuperficies.

II. If a given quantity, for example a line, be divided into any number of equal parts, it is poſſible to aſſume an indefinitely great number of lines all differing in length, but which ſhall each reſpectively be compoſed of ſome exact number of parts, of the ſame magnitude with thoſe into which the given line was divided. And it is likewiſe poſſible to aſſume an indefinitely greater number of lines all differing in length, but which ſhall none of them be compoſed of any exact number of the ſaid parts. Quantities of the ſame kind, which may be divided, ſo that the aliquot or equal part of the one, ſhall be equal to an aliquot part of the other, are ſaid to be commenſurable; but if no aliquot part whatſoever of the one be equal to any aliquot part whatſoever of the other, the quantities are ſaid to be incommenſurable. Now incommenſurable quantities cannot be expreſſed by numbers: for if one of the quantities be expreſſed by any number, that number will denote the equal units or aliquot parts contained in the ſame; and ſince the other quantity does not conſiſt of aliquot parts of the ſame magnitude with thoſe equal units, no number of them can be equal to or exactly meaſure it. But the error which attends the numerical expreſſion of incommenſurable quantities, may be diminiſhed in any required degree by taking the aliquot parts extremely ſmall; for which reaſon the incommenſurability of quantities is never conſidered in practice. What follows in this chapter is therefore confined to numbers, or commenſurable quantities of the ſame kind meaſured by the multitude of equal units contained in each.

III. In the compariſon of two numbers with each other, we may attend either to their difference or to the numbers themſelves, that is to ſay, how many times the one is contained in the other. The firſt kind of relation is called their arithmetical ratio, and the latter their geometrical ratio. And this ratio, in any two numbers, is made uſe of as a kind of meaſure for the ſame ratio in other numbers. Numbers which have the ſame ratio are ſaid to be proportional, that is to ſay, if two numbers have the ſame difference as any other two numbers reſpectively, they are arithmetically proportional the greater in one couple to the leſs, as the greater in the other couple to the leſs; and contrarywiſe the leſs to the greater. And if two numbers produce the ſame quotient by dividing the former by the latter, as two other quantities produce in like manner, they are geometrically proportional; the firſt in one couple to the latter, as the firſt in the other couple to the latter. Thus for example, the numbers 1, 3, and 5, 7, are arithmetically proportional, becauſe the difference between 1 and 3 is the ſame as the difference between 5 and 7: and the numbers 2, 6, and 3, 9, are geometrically proportional.

IV. It is more uſual and convenient to confine the terms ratio and proportion to the geometrical relation of quantities.

V. The firſt of two quantities compared together geometrically is called the antecedent, and the latter the conſequent. The antecedent and conſequent are commonly ſeparated by this mark (:) and between each couple of like proportionals this mark (::) is placed. But when a ſeries of quantities are continually proportional alike, each to its following quantity, they are ſaid to be in geometrical progreſſion, or continued proportion, and the quantities are ſeparated either by a ſingle dot, (.) or the mark (:) between each. Thus in the proportion 2 : 3 :: 8 : 12. the numbers 2 and 8 are antecedents, and 3 and 12 are conſequents; and it is read as 2 is to 3, ſo is 8 to 12. But 2 : 6 : 18 : 54 : 162 are in geometrical progreſſion, the quantities 2 : 6, 6 : 18, 18 : 54, 54 : 162 being all in the ſame ratio.

Numbers which increaſe or decreaſe regularly, by the addition or ſubtraction of a common difference, are ſaid to be in arithmetical progreſſion.

The following axioms or ſelf-evident truths, are equally uſeful in the demonſtration of arithmetical and geometrical propoſitions.

I. If equal quantities be added to equal quantities, the wholes will be equal.

II. If equal quantities be ſubtracted from equal quantities, the remainders will be equal.

III. If equal quantities be multiplied by equal quantities, the products will be equal.

IV. If equal quantities be divided by equal quantities, the quotients will be equal.

V. Things equal to one and the ſame thing, are equal to each other.

THEOREM I.

In any ſeries of numbers in arithmetical progreſſion, the double of any term is equal to the ſum of any two terms equally diſtant from it.

Demonſtration. In any arithmetical ſeries (2.4.6.8.10.12) aſſume one of the terms (8), and two others equally diſtant from it (4 and 12).

Then the greater extreme is equal to the mean term added to the common difference, repeated as many times as there are intervals between the greater extreme term and the middle or mean term, (or $8+4=12$).

Therefore by axiom 1, the mean term added to the common difference thus repeated, together with the leſs extreme, will be equal to the ſum of the extremes, $(4+8+4=4+12)$.

But the mean is equal to the leſs extreme added to a like repetition of the common difference.

Therefore the mean added to the mean, that is to ſay, twice the mean is equal to the ſum of the two extremes, or terms equally diſtant from it.

Which was to be proved.

Corollary I. Hence it is eaſy to find an arithmetical mean between any two numbers, by taking half their ſum.

Corollary II. Hence, likewiſe, in an arithmetical ſeries beginning with 0, the double of any term is equal to a term as far diſtant from that term on one ſide, as 0 is on the other.

THEOREM II.

In any ſeries of numbers in arithmetical progreſſion, the ſum of any two terms taken as extremes, will be equal to the ſum of any two other terms, equally diſtant from thoſe extremes, taken as means.

Demonſtration. If there be a term in the given ſeries equally diſtant from each extreme, it will alſo be as diſtant from one mean as from the other. For if the equal diſtances between the extremes and their correſpondent means be taken from the equal diſtances of the extremes from the middle term, the remaining diſtances of the means from the middle term will be equal, by axiom 2.

Then by theorem 1, the ſum of the extremes will be equal to twice the middle term, and ſo likewiſe will be the ſum of the means.

Therefore by axiom 5, the ſum of the extremes will be equal to the ſum of the means.

But if there be not ſuch a middle term, find by corol. 1. theor. 1. an arithmetical mean between the two terms, or means which are fartheſt within the extremes, and interpoſe like means between every two adjacent terms. The rank of numbers will then become an arithmetical ſeries of another kind.

In this ſeries, by the arguments already made uſe of, it is proved, that the ſum of the given extremes is equal to the ſum of the given means.

Which was to be proved.

Corollary. Hence in an arithmetical ſeries beginning with 0, the ſum of any two terms will be equal to a term as far diſtant on the one ſide from the term remoteſt from 0, as 0 itſelf is remote on the other ſide from the other term.

THEOREM III.

If four numbers be geometrically proportional, the firſt to the ſecond as the third to the fourth, the product of the extremes will be equal to the product of the means.

Demonſtration. Aſſume any four numbers, (2:4 : : 16:32) whereof the firſt is in the ſame ratio to the ſecond, as the third to the fourth.

Then by the nature of proportion, the firſt divided by the ſecond, $\left(\frac{2}{4}\right)$ will be equal to the third divided by the fourth, $\left(\frac{16}{32}\right)$.

Multiply each quotient by both the conſequents; and one product $\left(\frac{2}{4}\times4\times32 \text{ or } 2\times32\right)$ will be the product of the extremes, and the other product, $\left(\frac{16}{32}\times32\times4, \text{ or } 16\times4\right)$ will be the product of the means.

By axiom 3, theſe products will be equal.

Which was to be proved.

Corollary I. Hence if the product of the two means be divided by one extreme, the quotient will be the other extreme. On this is founded the practical rule called the Rule of Three.

Corollary II. Hence alſo if three numbers be continual proportionals, the product of the two extremes ſhall be equal to the ſquare of the mean. And a geometrical mean proportional between any two numbers, is eaſily found by multiplying them together, and extracting the ſquare root of the product.

THEOREM IV.

If the product of the extremes of four numbers be equal to the product of the means, the firſt will be in the ſame ratio to the ſecond as the third to the fourth.

Demonſtration. Aſſume any four numbers, (6, 4, 18, 12) the product of whoſe extremes is equal to the product of the means, that is, $(6\times12=4\times18.)$

Divide each product by the conſequent mean and extreme; and one quotient $\left(\frac{6\times12}{4\times12}\text{ or }\frac{6}{4}\right)$ will be the quotient of the firſt number divided by the ſecond, and the other quotient $\left(\frac{4\times18}{4\times12}\text{ or }\frac{18}{12}\right)$ will be the quotient of the third number divided by the fourth.

By axiom 4. Theſe quotients will be equal.

Therefore the numbers will be proportional, the firſt to the ſecond, as the third to the fourth.

Which was to be proved.

Corollary I. Hence it follows, that any four numbers which are proportional, the firſt to the ſecond, as the third to the fourth, will be proportional in like manner, tho' not after the ſame ratio, however their order be varied, provided the two extremes do either continue to be extremes, or elſe both become means.

Corollary II. Hence alſo, if three numbers be ſuch, as that the ſquare of the mean be equal to the product of the two extremes, they are continual proportionals.

THEOREM V.

Like multiples of numbers are in the ſame ratio as the numbers themſelves.

Demonſtration. Aſſume any two numbers (7, 9,) and multiply each by the ſame number (8). Then the firſt number will be to the ſecond, as the multiple of the firſt is to the like multiple of the ſecond (or 7:9::56:72).

For the product of the extremes; namely, of the firſt number and the multiple of the ſecond (7×72), will be as many times the product of the two numbers (7×9) themſelves, as the multiple (72) contains the number (9) itſelf.

And the product of the means; namely, of the ſecond number and the multiple of the firſt (9×56), will be as many times the product of the two numbers (9×7) themſelves, as the multiple (56) contains the number (7) itſelf.

But the multiples are like, and therefore the number of times the common product (7×9) of the two numbers, is taken in the product of the extremes, is equal to the number of times it is taken in the product of the means.

By axiom 3. The product of the extremes is equal to the product of the means, and therefore by theorem 4, the firſt is in proportion to the ſecond, as the multiple of the firſt is to the multiple of the ſecond.

Which was to be proved.

THEOREM VI.

If any antecedents and their conſequents be in the ſame ratio, the ſum of all the antecedents ſhall be to the ſum of all the conſequents likewiſe in the ſame ratio.

Demonſtration. Aſſume any antecedents with their conſequents in the ſame ratio, ($3:8::21:56$); and the ſum of the antecedents will be to the ſum of the conſequents, as one of the antecedents is to its conſequent, ($3+21:8+56::21:56$).

For any two antecedents are in the ſame ratio as their conſequents, by corol. 1, theor. 4. ($3:21::8:56$) and therefore the quotient of an antecedent by an antecedent, will be equal to the quotient of their reſpective conſequents divided the ſame way, $\left(\frac{3}{21}=\frac{8}{56}\right)$ by the nature of proportion.

Now if to the firſt antecedent or dividend be added the ſecond antecedent or diviſor, the quotient will be increaſed by unity or 1, $\left(\frac{3+21}{21}=1+\frac{3}{21}\right)$

And if to the firſt conſequent or dividend be added the ſecond conſequent or diviſor, the quotient will likewiſe be increaſed by unity or 1, $\left(\frac{8+56}{56}=1+\frac{8}{56}\right)$

Theſe quotients are therefore equal by axiom 1.

Therefore the ſum of both the antecedents is to the ſecond antecedent, as the ſum of both conſequents to the ſecond conſequent, ($3+21:21::8+56:56.$)

Or the ſum of both the antecedents is to the ſum of both the conſequents, as the ſecond antecedent to the ſecond conſequent; by corol. 1. theor. 4. ($3+21:8+56::21:56$).

And the ſame reaſoning may be extended to any number of antecedents and their conſequents.

Therefore, &c.

Which was to be proved.

THEOREM VII.

In any ſeries of numbers in geometrical progreſſion, the product of any two terms taken as extremes, is equal to the product of any other two terms equally diſtant from the extremes, taken as means.

Demonſtration. In any geometrical ſeries (1:2:4:8:16:32:64:128:256) let any two terms (2 and 256) be conſidered as extremes, and two others equally diſtant (16 and 32) from the extremes, be taken as means.

Then becauſe the terms are all alike proportional, each to its following term, it will be as one extreme is to its next adjacent term ſituated towards the other extreme, ſo is the term within and adjacent to the other extreme, to the other extreme (or 2:4::128:256).

Therefore by theorem 3, the product of the two terms within and adjacent to the extremes, will be equal to the product of the extremes.

By the ſame argument, the product of the two terms which are within and in the ſecond place remote from the extremes, will be equal to the product of the two adjacent terms within, and therefore, by axiom 5, equal to the product of the extremes.

And this argument may be continued to any diſtance of the terms within, and will prove that the product of any two terms equally diſtant within the extremes, that is to ſay, of any two terms taken as means, is equal to the product of the two extremes from which they are equally diſtant.

Which was to be proved.

Corollary I. Hence the ſquare of any term is equal to the product of any two terms equally diſtant from it. For by corollary 2, theorem 3, the ſquare of any term is equal to the product of the two adjacent terms; and by the preſent theorem, that product is equal to the product of any two equally diſtant terms.

Corollary II. Hence in a geometrical ſeries beginning with unity, the product of any two terms will be equal to a term as far diſtant on the one ſide, from the term remoteſt from unity, as unity itſelf is remote on the other ſide from the other term. And the ſquare of any ſingle term, will be equal to a term as far diſtant from that term on one ſide, as unity is on the other.

CHAP.

CHAP. III.

OF THE INVENTION AND USE OF LOGARITHMS.

LET there be aſſumed any geometrical ſeries of numbers, beginning with unity, and the common arithmetical ſeries of numbers beginning with 0. Range ſuch ſeries ſo that the firſt arithmetical term may correſpond with or be oppoſite to the firſt geometrical term, the ſecond oppoſite the ſecond, and ſo forth, as hereunder.

Arith. ſeries	0.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Geom. ſeries	1.	2.	4.	8.	16.	32.	64.	128.	256.	512.	1024.

In this arrangement, the arithmetical terms are commonly called indices, becauſe they indicate how far their correſpondent geometrical terms are remote in ſituation from unity, or the firſt geometrical term. Now from the corollary to theor. 2, and the ſecond corollary to theor. 7, conſidered together, it is evident that if any two indices be added together, their ſum will be correſpondent in ſituation to the product of the two geometrical terms anſwering to thoſe indices; and that if any index be doubled, its double will be the index of the ſquare of its correſponding geometrical term. Thus the indices 2 and 5 added together make 7, which correſponds in ſituation with 128, the product of 4 by 32: alſo 4 doubled is 8, which is the index of 256, the ſquare of 16. It may likewiſe be readily inferred, that the ſubtraction of the indices correſponds with the diviſion of the geometrical terms, and that biſection anſwers to the extraction of the ſquare root, triſection to the extraction of the cube root, &c.

If the above or any other geometrical ſeries, with its indices, were continued to a great length, it is clear that we might perform the operations of multiplying, dividing, involving, or extracting of roots of very many numbers, that is to ſay, of any of its terms, by addiſion, ſubtraction, multiplication, or diviſion of its indices. But there is a manifeſt objection to the general utility of ſuch a table or ſet of numbers, that the terms contained in the table would be incomparably fewer than thoſe which were left out. And indeed if there were not a remedy for this, it would anſwer no purpoſe to compute ſuch a table.

John Neper, Baron of Merchiſton in Scotland, was the firſt who diſcovered this uſeful method of ſhortening arithmetical calculations: he having publiſhed in 1614 a table of the natural numbers, to which, conſidered as part of a geometrical ſeries, he adapted their correſpondent indices. Theſe indices he called Logarithms ; a word which ſignifies a *number of ratios*, and is more expreſſive than the word index. The propriety of its application is apparent from the conſideration that the logarithm or index of any term denotes how many times the common ratio has been repeated from unity to the ſaid term.

Since a table of logarithms, or the indices 1, 2, 3, 4, &c. may be adapted to any geometrical ſeries of numbers, it is obvious that the form of logarithms admits of an indefinitely great variety. The noble inventor, after conſulting with Mr. Henry Briggs, Profeſſor of Aſtronomy at Greſham college, made choice of the following ſeries, as being in ſeveral reſpects more convenient than any other.

0.	1.	2.	3.	4.	5.
1.	10.	100.	1000.	10000	100000.

By the 2d corollary to theorem 3, a geometrical mean may be interpoſed between every two adjacent terms of the geometrical ſeries; and by corollary 1, theorem 1, their correſpondent indices may be placed in the rank of arithmetical numbers. By this means the progreſſion will have a different ratio, and its terms will become more numerous. In this laſt ſeries, other geometrical means and their indices may be in like manner interpoſed : and by carrying on the proceſs, the terms between any two extremes may be made exceedingly numerous, inſomuch, that any natural number whatever, will either be actually found among the terms of the geometrical ſeries, or elſe ſome number which will differ inconſiderably from it, and may therefore without any practical error be taken for it. It is evidently unneceſſary to ſet down in the table to be conſtructed, any of the means thus diſcovered, except ſuch as anſwer to the natural range of numbers, and therefore the calculator muſt endeavour, as much as poſſible, to avoid the trouble of finding the others. There are many ingenious methods of computing the logarithms of numbers, but as they are chiefly deduced from the higher branches of the mathematics, it is proper to avoid explaining them in this place. The firſt tables of logarithms were computed in the manner we have deſcribed, and which we ſhall proceed to illuſtrate by explaining the calculus by which the logarithm of a ſingle number is found ; for example, the number 9. This number lies between the terms 1 and 10 of the ſeries.

	Geom. mean.	between	Arith. mean or log.	between
Firſt	3.1622777	1.0000000 & 10.0000000	0.5	0. & 1.
Second	5.6234132	3.1622777 & 10.0000000	0.75	0.5 & 1.
Third	7.4989421	5.6234132 & 10.0000000	0.875	0.75 & 1.
Fourth	8.6596431	7.4989421 & 10.0000000	0.9375	0.875 & 1.
Sixth	8.9768713	8.6596431 & 9.3057204	0.953125	0.9375 & 0.96875
Fifth	9.3057204	8.6596431 & 10.0000000	0.96875	0.9375 & 1.

In this table of means it may be obſerved, that the ſixth mean approaches the number 9, within $\frac{3}{100}$ parts of an unit; and by continuing the calculation, a mean may be found to any required degree of exactneſs. After twenty five extractions, the mean 8.9999998 will be found to correſpond with the Index or logarithm .9542425; which may be taken for the logarithm of 9, becauſe the difference between 8.9999998 and 9, is an error which may be diſregarded in almoſt every practical operation.

From the logarithm of 9 thus found, it is eaſy to obtain the logarithms of many other numbers, without having recourſe to the extraction of roots. For the whole numbers 1, 2, 3, &c. being the logarithims of 10, 100, 1000, &c. if they be reſpectively added to .9542425, the ſums will be the logarithms of 90, 900, 9000, &c. or the products of 9 by thoſe numbers, as is clear from what has already been ſaid. And if .9542425 be halved, the half will be the logarithm of 3, the ſquare root of 9. Again, the logarithm of 3 being added to the logarithm of 9, the ſum will be the logarithm of 27, or the product of 3 by 9. And in this manner may many other logarithms be found; ſo that in computing an entire table, it is not neceſſary to find above a tenth part of the numbers by the extraction of roots, the others being obtained by addition or ſubtraction only.

After this explanation of the nature of theſe artificial numbers, it will be eaſy to underſtand their uſe. In the table of logarithms, the decimal part only of the logarithm is ſet down, becauſe the integral part may be very readily ſupplied by the operator. This integral part is uſually termed the index or characteriſtic; and in any natural number the index of the logarithm will be a number which is leſs by 1 than the number of figures, excluſive of fractions which is contained in the ſaid natural number. For in the ſeries

0.	1.	2.	3.	4.	5.
1.	10.	100.	1000.	10000.	100000.

it is clear that any natural number conſiſting of one figure, that is to ſay, which falls between 1 and 10, will have a logarithm which ſhall fall between 0 and 1, namely, a fraction; if it conſiſt of two figures, the logarithms will fall between 1 and 2; or ſhall conſiſt of the index 1 as a whole number and a fraction adjoined to it. And it may be inferred that the ſame rule takes place in other numbers. The following exemplification will ſerve to render this matter ſtill clearer.

Num.	Log.
5728	3.7580030
572.8	2.7580030
57.28	1.7580030
5.728	0.7580030
.5728	$\bar{1}$.7580030
.05728	$\bar{2}$.7580030

Here it is ſeen, that the fractional part of the logarithm of 5728 is always the ſame, but that the index is leſs by 1 than the number of integral figures contained in that natural number. When there is but one integral figure the index is 0, but when the number conſiſts only of a decimal fraction, the index is a negative number, which denotes how far removed the firſt effective figure of the fraction is from the decimal point. The truth of this appears by conſidering, that the value of any fraction is its numerator divided by its denominator; and therefore that the logarithm of ſuch fraction, muſt be found by ſubtracting the logarithm of its numerator from the logarithm of its denominator. Thus the fraction .05728 ſignifies $\frac{5728}{100000}$ or 5728 divided by 100000. Therefore

From	3.7580030	the Logarithm of 5728
Take	5.0000000	the Logarithm of 100000
Remains	$\bar{2}$.7580030	Logarithm of $\frac{5728}{100000}$
Or	—1.2419970	Logarithim of $\frac{5728}{100000}$

The two remainders are of equal value, though they are differently expreſſed. In producing the firſt remainder, the difference of the indices only was taken, and therefore the index only of the remainder is negative, and is uſually diſtinguiſhed by a ſhort line or daſh over it; but in the ſecond remainder, the difference of the logarithms was taken, and therefore the whole remainder is negative. That they are equal is apparent by ſubtracting the ſame quantity .7580030 from each.

From $\bar{2}.7580030$ From -1.2418979
Take 0.7580030 Take 0.7580030

Remains $\bar{2}.0000000$ equal to Remainder $\bar{2}.0000000$

Thoſe who are acquainted with the rudiments of algebra, will find no difficulty in underſtanding what is here ſaid of negative numbers; but for the ſake of thoſe who are not, it is neceſſary to remark that a negative quantity is conſidered as leſs than nothing. Now there is no abſurdity in affirming that ſuch quantities may have a real being, becauſe the negation does not affect their exiſtence, but their value comparatively with ſome other quantity taken. Thus, if a man has £. 200 owing to him, at the ſame time that he owes £. 200, he is worth nothing; becauſe if his dues be conſidered as poſitive value, his debts will be negative, or of a contrary nature; and conſentaneouſly to this, if his debt were £. 300, his eſtate would be £. 100 of debt or negative, that is to ſay, £. 100 leſs than nothing. Which £. 100 is not leſs really exiſting than a poſitive £. 100, though by being to be paid, it is with reſpect to comparative value, directly oppoſite to a ſum to be received. From many inſtances of quantities of the ſame kind, which are thus affected by being ſet in oppoſition, we ſhall mention one more. Suppoſe a ſhip be bound to a port bearing ſouth, then we may call that diſtance poſitive which ſhe ſails on a ſouth courſe, or *towards* the port; and conſequently any diſtance ſailed on a north courſe, or *from* the port, will be negative. For if the ſhip remain ſtationary, her advancement will be nothing; if ſhe ſail ten leagues ſouth, her advancement will be ten leagues poſitive; and if ſhe ſail ten leagues north, her advancement will be ten leagues negative, or leſs than if ſhe had ſtood ſtill; that is leſs than nothing. In this inſtance likewiſe we ſee, that the ten leagues negative are as really exiſting as the ten leagues poſitive; and that the negation only affects their value, comparitively with the diſtance ſailed on the oppoſite direction, namely, their value conſidered as advancement.

From the nature of theſe negative quantities, it is evident that the addition of a negative quantity, is the ſame as the ſubtraction of a poſitive quantity; and the ſubtraction of a negative quantity, is the ſame as the addition of a poſitive quantity. And therefore, whenever negative quantities are required, either to be added or ſubtracted, we may ſuppoſe them poſitive, and add inſtead of ſubtracting, or ſubtract inſtead of adding.

To find the logarithm of any number by the table. Seek the three firſt figures of the number in the column intitled num. and if it conſiſt but of three figures, its logarithm will be found on a line with it in the column intitled o.

If it conſiſt of four figures, ſeek the three firſt as before, and the logarithm will be found on a line with them, in that column at the head of which the fourth figure is placed.

But if it conſiſt of more than four figures, take the logarithm of the firſt four figures, and ſubtract it from the next following logarithm, multiply this difference conſidered as a whole number, by the remaining part of the natural number conſidered as a decimal, and the product added to the firſt or leſſer logarithm, will be the logarithm of the number as required. The logarithm found by the table muſt be completed by prefixing the index as already ſhewn.

To find the number of any logarithm. Seek the logarithm in the table; the firſt three figures of the number will be found on a line with it, in the column num. and the fourth at the head of the column in which the logarithm is placed. Cut off as many integral figures as may exceed the index by one, adding cyphers to the right hand, if the index exceed 3: but if the index be negative, make the figures a decimal, and by adding cyphers to the left if required, remove the firſt effective figure as many places from the decimal point, as the number of the index denotes.

But if the logarithm cannot be exactly found in the table, take the difference between the two neareſt logarithms to it on each ſide, and alſo the difference between it and the leſs logarithm of the two. Add cyphers to this laſt difference, and divide by the firſt; and the quotient muſt be adjoined to the four figures anſwering to the leſſer logarithm, and will make the number required. The value of this number in integers or fractions, muſt be determined from the index as before.

The tables in this work are carried to no farther than five places of figures, which is ſufficient for all common nautical purpoſes.

EXAM-

EXAMPLES OF DECIMAL ARITHMETIC BY LOGARITHMS.

It is required to multiply 162 by 5769.

162	log.	2.20951
5769	log.	3.76110
934560		5.26061

Here the ſum of the two logarithms, which is the logarithm of the product, is not found in the table; therefore the difference of the two neareſt muſt be taken, namely

.97058
.97063

5

And alſo the difference between the given logarithm and the leſs of the two;

.97058
.97061

3

To which add cyphers, and divide by the former difference;

5) 3.0 (6 quotient to be adjoined.

But in moſt calculations which are performed by logarithms, it is ſufficient to know the firſt four figures, and to ſupply the other places with cyphers inſtead of finding the parts by means of the differences. Thus the number of the neareſt logarithm or 9346 muſt have been taken; and becauſe the index is 5, two cyphers muſt have been added to complete the number of figures 934600.

It is required to divide 7462 by 278.

7642	log.	3.88321
278	log.	2.44404
Quotient 27.49.		1.43917

Here the quotient is a ſmall matter too great in the laſt figure, becauſe the neareſt logarithm in the table is rather larger than the logarithm ſought.

It is required to extract the ſquare root of 532900.

	532900	log.	5.72664
Square root	730	log.	2.86332 half.

It is required to extract the cube root of 3375.

	3375	log.	3.52827	
Cube root	15	log	1.17609	third part.

If 2540 men conſume 120 cwt. of bread in a week, what quantity will 656 men conſume in the ſame time?

As	2520	ar. co. log.	6.59860
Is to	120	log.	2.07918
So is	656	log.	2.81690
To	31.24		1.49468

In working proportions, the logarithms of the ſecond and third terms are added, and the logarithm of the firſt ſubtracted, which is correſpondent with the multiplication and diviſion of the terms as in the rule of three. But that the whole might be performed by addition only, the arithmetical complement of the logarithm of the firſt term to 10. or unity in the next ſuperior place, is taken inſtead of the logarithm itſelf, and the ſum of 10. is deducted from the total. For it is evident that if the difference between any two numbers be added to a third number, the ſum will be equal to the difference between the firſt and third added to the ſecond. Thus in numbers, if 8 be taken from 12, and the remainder added to 26, the ſum 30 will be equal to the difference between 8 and 26 added to 12: if therefore 12, or the ſecond, be taken from 30, the ſum, the remainder will be the difference between 8 and 26. And ſo likewiſe if the logarithm of 2520 be taken from 10. and this remainder be added to any number or numbers, the whole ſum diminiſhed by the ſubduction of 10, will be the ſame as if the logarithm of 2520 had been originally ſubtracted from thoſe numbers.

The eaſieſt way of finding the arithmetical complement of a number is, to begin at the left hand, and take away every figure from 9, except the laſt, which take from 10. The remainder ſet down in order, will be the arithmetical complement.

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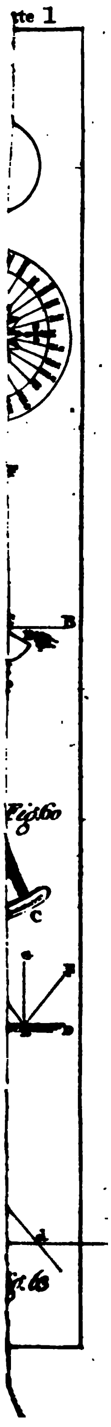

BOOK I.

SECT. II. OF GEOMETRY.

CHAP. I.

GEOMETRICAL DEFINITIONS.

1. A *Solid* is that which has length, breadth, and thickneſs. 2. A *Superficies* is that which bounds a ſolid; that is to ſay, it hath length and breadth, but not thickneſs.

3. A *Line* is that which bounds a ſuperficies; that is to ſay, it has length, but neither breadth nor thickneſs.

4. A *Point* is the termination of a line; that is to ſay, it has no part.

A line may be conceived to be produced or generated by the motion of a point; a ſuperficies by the motion of a line not carried end-ways; and a ſolid by the motion of a ſuperficies not carried edgeways.

For all practical purpoſes, the ſtroke which is deſcribed on any ſuperficies by the motion of a pointed inſtrument may be called a line, notwithſtanding its ſenſible breadth; for the error ariſing from that breadth when extremely ſmall, may be neglected as of no conſequence; and the arguments are not at all affected, becauſe they relate only to figures accurately mathematical.

5. A *Right Line* is that which meaſures the diſtance between its extreme points, as AB. Fig. 1.

6. A *Curve Line* is that which does not meaſure the diſtance between its extreme points, as CD. Fig. 2.

7. A *Plane*, or *plane ſuperficies*, is that whoſe parts are evenly diſpoſed within its bounds, ſo that it has neither cavity nor protuberance.

8. *Parallel Lines* are lines in the ſame plane, which if prolonged indefinitely either way, would never meet; or they are lines which have no inclination towards each other; as AB, BC. Fig. 3.

9. An *Angle* is that which is formed by the indireſt meeting of two lines; and its quantity is meaſured by the mutual inclination of the lines to each other at the point of meeting.

10. A *right lined Angle* is that which is formed by two right lines.

An angle is uſually marked by three letters, as the angle ABC, fig. 4; the letter at the angular point being always read in the middle between the other two.

The lines which form an angle are called its legs.

11. When a right line ſtands upon another right line, ſo as to make the angles on each ſide equal, the former line is ſaid to be a *Perpendicular* to the latter; and each of the equal angles is called a *right Angle*. Thus the line AB is perpendicular to CD, and the equal angles ABC and ABD are right angles. Fig. 5.

12. An *obtuſe Angle* is greater than a right angle. Thus ABC is an obtuſe angle. Fig. 6.

13. An *acute Angle* is leſs than a right angle. Thus ABC is an acute angle. Fig. 7.

Obtuſe and acute angles are called oblique angles.

14. A *Circle* is a plane ſuperficies, deſcribed by the revolution of a right line about one of its extreme points, which remains fixed till the right line arrives at the place from which it firſt began to move. Or it is a plane ſuperficies bounded by a line, and having a point within it, from which all right lines drawn to the bounding line are equal.

15. The curve line which bounds a circle is called its *Circumference*, or *Periphery*; and the fixed point about which the revolution was made, is called the *Center*. Thus ABK is the periphery of a circle, and C is the center. Fig 8.

16. Any right line drawn from the center to the circumference of a circle, is called a *Radius*; as CF. Fig. 8.

All the radii of the ſame circle are equal.

17. A *Arc* is any part of the circumference.

18. A right line joining the extreme points of any arc, is called the *Chord* of that arc. Thus HI is the chord of the arc HKI. Fig. 8.

19. A *Diameter* is a chord paſſing through the center; as FG. Fig. 8.

20. A *Tangent* to a circle is a line which touches the periphery without cutting it, even if prolonged. The point at which the periphery of the circle and the tangent coincide, is called the point of *Contaſt*. Thus IM is a tangent to the circle, and N is the point of contaſt. Fig. 8.

21. A *plane Triangle* is a figure bounded by three right lines; as ABC. Fig. 9.

The right lines which bound a figure, are uſually called *Sides.*

22. Triangles are named from certain relations of their angles or ſides. A *right angled Triangle* is that which has one right angle; as ABC whoſe angle B is a right angle. Fig. 9.

23. An *obtuſe angled Triangle* has one obtuſe angle. Thus BCD has the angle C obtuſe. Fig. 10.

24. An *acute angled Triangle* has all its angles acute; as CDE. Fig. 11.

Obtuſe and acute angled triangles, are called oblique angled triangles.

25. An *equilateral Triangle* has all its ſides equal; as DEF. Fig. 12.

26. An *iſoſceles Triangle* has two of its ſides equal, as EFG; in which EF and FG are equal. Fig. 13.

27. A *Square* is a figure having four equal right lined ſides, and four right angles; as ABCD. Fig. 14.

28. A *Parallelogram* is a figure having four right lined ſides, thoſe which are oppoſite to each other being parallel and equal; as BCDE. Fig. 15.

29. A *Rectangle* is a parallelogram whoſe angles are all right angles; as CDEF. Fig. 16.

CHAP. II.

GEOMETRICAL PROBLEMS.

IT is taken for granted in Geometry, that a right line may be drawn from one given point to another given point; that a given right line may be continued or prolonged to any diſtance; and that a circle may be deſcribed with any given radius. Theſe are termed poſtulates or petitions, and the ſpeculative geometer does not concern himſelf about the manner in which they may be performed; it being ſufficient for his purpoſe, that the poſſibility of their accompliſhment be allowed. But our practical intention requires us to obſerve, that a right line is uſually deſcribed by the edge of a ſtrait ruler; that its length is limited by the help of a pair of compaſſes; and that a circle is deſcribed by the motion of one foot of a pair of compaſſes about the other, which is fixed, the opening or interval between them being previouſly adapted to the length of the intended radius.

PROBLEM I.

To conſtruct a Triangle whoſe ſides ſhall be equal reſpectively to three given right lines; provided any two of the ſaid right lines be longer when taken together, than the third or remaining one. Fig. 17.

Let AB, BC, CD, be the given right lines.

Conſtruction. Draw the line DE equal to AB.

From the point D, with the radius BC, deſcribe a circle or arc.

From the point E, with the radius CD, deſcribe a circle or arc; interſecting the former circle in the point F.

From F draw right lines to the points D and E.

The triangle DEF will be the triangle required.

PROBLEM II.

To raiſe a perpendicular from a given point in a given right line. Fig. 18.

Let AB be the given right line, and C the point.

Conſtruction. From C cut off either way the equal diſtances CD and CE in the line AB.

From the point D, with a radius exceeding DC, deſcribe a circle or arc; and from E, with the ſame radius, deſcribe another circle or arc, interſecting the former in F.

From C, through F, draw the right line CF, which will be the perpendicular required.

Demonſtration. Join FE and FD, and imagine the triangle FCE to be raiſed out of the plane ſo as to revolve on the line FC as an axis, 'till it becomes poſited upon the triangle FCD.

Then the point E will coincide with the point D; becauſe its diſtance from the points F and C is, by the conſtruction, equal to FD and CD.

And the triangle FCE will be equal and congruous to the triangle FCD in all reſpects.

The angles FCE and FCD are therefore equal: and FC is conſequently perpendicular to AB. (Def. 11.)

Conſectary I. All triangles are congruous which have (1,) the ſides of the one reſpectively equal to the ſides of the other: or, (2,) two ſides and the included angle of the one equal reſpectively to two ſides and the included angle of the other: or, or (3,) one ſide and its two contiguous angles in the one reſpectively equal to one ſide and its two contiguous angles in the other: or (4,) one ſide, the oppoſite angle, and one contiguous angle reſpectively equal to one ſide, the oppoſite angle, and one contiguous angle of the other.

Conſectary II. The angles at the baſe of an iſoſceles triangle are equal, becauſe every iſoſceles triangle may be divided into two congruous right-angled triangles, by letting fall a perpendicular upon the baſe from the angular point formed by the equal ſides.

PROBLEM III.

To let fall a perpendicular from a given point to a given indefinite right line. Fig. 19.

Let AB be the given indefinite right line, and C the given point.

Conſtruction. With a radius exceeding the ſhorteſt diſtance between C and the line AB, deſcribe a circle or arc cutting AB in D and E.

From the point D, with a radius exceeding the half of DE, deſcribe a circle or arc; and from E, with the ſame radius, deſcribe another circle or arc, interſecting the former in F.

From C, thro' F, draw the right line CF, interſecting AB in G. CG is the perpendicular required.

Demonſtration. Join CD and CE, and alſo DF and EF.

Then if the congruous triangles CEF and CDF be imagined to be placed ſo as to coincide, the point E will agree with the point D; and GE will coincide with and therefore is equal to GD.

Whence it follows, that the triangles CEG and CDG are congruous, and the angles CGE and CGD are equal.

The line CG is conſequently perpendicular to AB.

PROBLEM IV.

To biſect a given finite right line. Fig. 20.

Let AB be the given line.

Conſtruction. With any radius exceeding the half of AB, from the point B, deſcribe a circle or arc.

With the ſame radius, from the point A, deſcribe a circle or arc, interſecting the former in the points C and D.

Thro' the points C and D draw a right line, which will biſect the given right line in E as required.

Demonſtration. This is proved from the congruous triangles CAD and CBD, which being mentally applied to each other, the lines AE and EB coincide, and are therefore equal.

PROBLEM V.

At a given point in a right line to conſtruct a right-lined angle equal to a given right angle. Fig. 21.

Let ABC be the given angle, and DE the given right line, at the point E of which the angle is required to be conſtructed.

Conſtruction. From the point C, with any convenient radius, deſcribe an arc, cutting CA in F, and CB in G.

With the ſame radius, from the point E deſcribe a circle or arc, cutting ED in K.

Make KL equal to FG; and through L draw the line EL. The angle KEL will be the angle required.

Demonſtration. If right lines be drawn from F to G, and from K to L, the triangles FCG and KEL will be congruous, and the angle FCG in the one triangle, will be equal to the angle KEL in the other.

Corollary. The arcs of equal circles which ſubtend equal right lined angles are themſelves congruous, and therefore equal.

PROBLEM VI.

To draw a right line parallel to a given right line, through a point ſituated without the given right line. Fig. 22.

Let AB be the given right line and C the point.

Conſtruction. From C to any point in the line AB, draw the line CD.

Draw the line CE, ſo that the angle ECD may be equal to CDB; and CE ſhall be parallel to AB as required.

Demonſtration. The inclination of the line CD to AB, is meaſured by the angle CDB. (Def. 9.) And if CD be ſuppoſed to revolve from the line AB on the center C, its inclination will become leſs and leſs; and when it has paſſed through an angular ſpace equal to CDB, will be entirely deſtroyed. But by the conſtruction it muſt then coincide with CE. Therefore CE has no inclination towards AB; that is to ſay, it it parallel to it. (Def. 8.)

Corollary. When a right line croſſes two other right lines, and makes the alternate angles equal, the two lines ſo croſſed are parallel

CHAP.

CHAP. III.

GEOMETRICAL THEOREMS.

THEOREM I.

IF a right line ſtanding on another right line makes angles, theſe angles both together will be equal to two right angles. Fig. 23.

Demonſtration. Let the right line CD ſtand upon the right line AB, forming the angles CDA, CDB.

Then if the angles CDA, CDB be equal, they will be right angles. (Def. 11.)

But if they be unequal, erect the perpendicular DE from the point D.

The angles CDA, CDB taken together, will then be equal to all the three angles CDA, CDE, EDB.

Now the angles CDA, CDE together, are equal to the right angle ADE; and the angle EDB is itſelf a right angle.

Therefore all the three angles CDA, CDE, EDB, are equal to two right angles; and ſo likewiſe are the angles CDA, CDB taken together. (Axiom 5.)

Which was to be proved.

Corollary. The adjacent angles taken together, which are formed by any number of right lines ſtanding on the ſame ſide, at the ſame point of a right line continued both ways, are equal to two right angles.

THEOREM II.

The vertical angles of right lines which croſs each other are equal. Fig. 24.

Demonſtration. Let the right lines AB, CD, croſs each other at E. Then the vertical angles CEB, AED are equal; and the vertical angles AEC, DEB are alſo equal.

For the angles AEC, CEB, are together equal to two right angles. (Theorem 1.)

And the angles AEC, AED, are together alſo equal to two right angles.

Therefore the angles AEC, CEB, together are equal to the angles AEC, AED, taken together.

And if from theſe equal quantities be taken the common angle AEC, the remaining angles CEB, AED, will be equal. (Axiom 2.)

But theſe remaining angles are vertical angles.

In like manner it may be proved, that the vertical angles AEC and DEB are equal.

Which was to be proved.

THEOREM III.

If a right line croſs two parallel right lines, it will make the outward angles each equal to the inward oppoſite angle on the ſame ſide. Fig. 25.

Demonſtration. Let the parallel lines AB, CD, be croſſed by the right line EF. Then the outward angles EHB, EHA, FGC, FGD, ſhall be reſpectively equal to the inward oppoſite angles on the ſame ſide EGD, EGC, FHA, FHB.

For the angle EHB is equal to its vertical angle FHA. (Theorem 2.)

And the angle EGD is equal to its alternate angle FHA. (Prob. 6.)

Therefore the outward angle EHB is equal to the inward oppoſite angle on the ſame ſide EGD. (Axiom 5.)

In like manner it may be proved, that the outward angles EHA, CGF, FGD are reſpectively equal to the inward oppoſite angles on the ſame ſide EGC, AHF, FHB.

Which was to be proved.

Corollary. If a right line croſſing two other right lines make the outward angles equal each to the inward oppoſite angle on the ſame ſide, the two lines ſo croſſed ſhall be parallel.

THEOREM IV.

If two parallel right lines croſs two other parallel right lines, the ſpace comprehended between them ſhall be a parallelogram. Fig. 26.

Demonſtration. Let the parallel lines AB, CD, be croſſed by the parallel lines EF, GH. Then the ſpace IK ML comprehended between them ſhall be a parallelogram. Join IM.

For the angle ILM is equal to the angle CLF; (Theo. 2.) the angle CLF is equal to the angle AIF; (Theo. 3.) and the angle AIF is equal to the angle AKH. (Theo. 3.)

Therefore the angle ILM, in the triangle ILM, is equal to the angle AKH, or IKM, in the triangle IKM. (Axiom 5.)

The angles IML and KIM are equal. (Prob. 6.)

And the ſide IM is common to both triangles.

Conſequently, the triangles IKM, MLI, are congruous; (Conſect. 1. Prob. 2.) the ſide IK being equal to the ſide LM, and the ſide IL equal to the ſide KM. And by the conſtruction they are parallel.

The ſpace IKLM is therefore a four-ſided right lined figure, whoſe oppoſite ſides are parallel and equal: that is to ſay, it is a parallelogram. (Def. 28.)

Which was to be proved.

THEOREM V.

In every plane triangle, the three angles are together equal to two right angles. Fig 27.

Demonſtration. Let ABC be the given triangle.

Thro' one of the angular points B, draw the line DE parallel to the oppoſite ſide AC.

The angle DBA is equal to the angle BAC, and the angle EBC is equal to the angle BCA, for they are alternate. (Prob. 6.)

Wherefore the three angles BAC, BCA, ABC together, are equal to all the three angles DBA, EBC, ABC. And theſe laſt three are equal to two right angles. (Corol. to Theo. 1.)

Conſequently the three angles BAC, BCA, ABC are together equal to two right angles. (Axiom 5.)

Which was to be proved.

Corollary I. Two plane triangles which have two angles of the one reſpectively equal to two angles in the other, will likewiſe have the third or remaining angle in the one, equal to the third or remaining angle in the other; or they will be equiangular.

Corollary II. In a right angled triangle, the two acute angles are together equal to a right angle.

Corollary III. Any two angles of a plane triangle, are together leſs than two right angles.

THEOREM VI.

In every plane triangle, the outward angle formed by prolonging one of the ſides, is equal to the two inner oppoſite angles taken together. Fig. 28.

Demonſtration. Let ABC be the given triangle, whoſe ſide AC is prolonged to D.

Then the angles ACB, BCD, are together equal to all the three angles ACB, CBA, BAC; for each ſum is equal to two right angles. (Theo. 1 and 5.)

From each ſum take the common angle ACB, and the remaining angle BCD, or the outward angle, will together be equal to the remaining angles CBA, BAC, or the two inner oppoſite angles taken together. (Axiom 2.)

Which was to be proved.

THEOREM VII.

In every plane triangle, the greater angle is oppoſite the greater ſide. Fig. 29.

Demonſtration. Let ABC be the given triangle, having the ſide AC longer than the ſide AB.

Upon the longer ſide AC from the angle A, formed between the two ſides under conſideration, ſet off AD equal to AB the other ſide, and join BD.

Now the angle ADB is equal to the two inner oppoſite angles DBC, DCB, of the triangle DBC; (Theorem 6.) and therefore is greater than the angle DCB.

And the angle ABD in the iſoſceles triangle ABD, is equal to the angle ADB, (conſec. 2. prob. 2.) and conſequenly greater than the angle DCB.

Whence the angle ABC is much greater than the angle DCB.

But theſe two laſt mentioned angles are reſpectively oppoſite the ſides AC and AB, of the triangle ABC; the greater angle being oppoſite the greater ſide.

Which was to be proved.

Corollary I. Hence alſo in any plane triangle, the greater ſide is oppoſite the greater angle.

Corollary II. And the ſides oppoſite to equal angles are equal.

THEOREM VIII.

In any plane triangle, if a line be drawn parallel to one of its ſides, and cutting the other two ſides, the oppoſite ſegments of the ſides ſo cut, ſhall be in proportion to the ſides to which they belong. Fig. 30.

Demonſtration. Let ABC be the given triangle, whoſe ſides AB and BC are cut by the line DE, drawn parallel to AC. Then I ſay BD:BE::DA:EC::BA:BC.

From B let fall the perpendicular BF. Divide BA, one of the ſides cut by DE into any number of equal parts, by continual biſection, (prob. 4.) or otherwiſe.

Through the points of diviſion draw the lines d n, c o, b p, parallel to AC, and falling on BF in the points n, o, p.

On the parallel lines immediately beneath, from each point let fall ſeverally the perpendiculars d q, c r, b s.

Then the right angled triangles B d n, d c q, c b r, b A s, will be congruous; (con. to prob. 2.) and the parts B n, n o, o p, p F, will be equal to the perpendiculars B n, d q, c r, b s, and conſequently to each other. (Theo. 4.)

It will therefore be, as the hypothenuſe B d of one of the triangles is to its perpendicular B n, ſo is any multiple of the hypothenuſe, for example B b, to a like multiple of the perpendicular, namely B p, or the part of B F cut off between B, and the parallel line b p paſſing through b. (Theo. 5. ſect. 1.)

And, As any multiple of B d is to any other multiple of B d, ſo is the equal multiple of B n, correſponding with the antecedent, to the equal multiple of B n correſponding with the conſequent.

Now AB may be ſo divided, that the given ſegment BD ſhall either be a multiple of B d, or indefinitely near it. Conceive it to be ſo divided, B v will then be the ſame multiple of B n, as BD is of B d.

Whence, As BD the multiple of B d,
Is to BA another multiple of B d,
So is B v the equal multiple of B n, correſponding with the antecedent,
To BF the equal multiple of B n, correſponding with the conſequent.

Again. Let the ſide BC be divided into a like number of equal parts as the ſide BA. From the points of diviſion draw the lines m n, g o, e p, parallel to AC, and let fall the perpendiculars m w, g x, e y. By the reaſoning applied already to the ſide BA, theſe parallels will divide BF into a like number of equal parts. They will conſequently meet the parallels drawn from the points of diviſion in BA, and will each conſtitute a right line with its oppoſite.

And in the ſame manner as the proportion of BD to BA was found, it is proved that BE:BC::B v:BF.

BE is therefore in the ſame proportion to BC, as BD to BA, or by changing the order of the terms BD:BE::BA:BC. And EC (or BC leſs BE) is to BC, as DA (or BA leſs BD) to BA, or by changing the order of the terms DA:EC::BA:BC.

That is to ſay, BD:BE::DA:EC::BA:BC. Which was to be proved.

Corollary. If two ſides of any plane triangle be cut by a right line, ſo that the oppoſite ſegments may be in proportion to the ſides to which they belong, then ſhall the cutting line be parallel to the third ſide.

THEOREM

THEOREM IX.

In equiangular plane triangles, the ſides oppoſite to equal angles are proportional. Fig. 31.

Demonſtration. Let ABC and a b c be two triangles, having the angles A equal to a, B equal to b, and C equal to c. Then AB:ab::BC:bc::CA:c a.

Upon the ſide AC of one of the triangles, prolonged if need be, from an angle A ſet off the diſtance A e, equal to the ſide a c, which in the other triangle is oppoſite the angle b, which is equal to the angle B, oppoſite the ſide AC.

From the ſame angle A in the firſt triangle, ſet off A d on the other adjacent ſide, equal to a b the ſide which in the other triangle together with the ſide a c already taken, contains the angle a equal to A.

Join e d, and the triangles a b c and Ad e will be congruous. (Con. to Prob. 2.)

And by reaſon of the equal angles d e A and BCA, the line d e is parallel to the ſide BC. (Corol. to theor. 3.)

Therefore (Theor. 8) A e (or a c):AC::Ad (or a b): AB.

Again, upon the ſide AC, from the angle C, ſet off Cm equal to the ſide ac, which in the other triangle is oppoſite the angle b, which is equal to the angle B oppoſite to the ſide AC.

And from the ſame angle, on the other adjacent ſide, ſet off Cn equal to cb, the ſide which in the other triangle, together with the ſide ac already taken, contains the angle c equal to the angle C.

Join mn, and the triangles abc and mnC will be congruous.

And by reaſon of the equal angles mnC and BAC, the line nm is parallel to the ſide BA. (Corol. to theor. 3.)

Therefore (theor. 8) mC (or ac):AC::Cn (or cb):CB.

From which, and the foregoing proportions, it follows AB:ab::BC:bc::CA:ca.

Which was to be proved.

Scholium. It is uſual to call thoſe triangles *ſimilar* which are equiangular, and the ſides oppoſite to equal angles are called *like* ſides.

THEOREM X.

Right-lined angles are in proportion to each other, as the arcs of equal circles contained by their legs. Fig. 32.

Demonſtration. Let the angles DAE, dae, be given, from the points A, a, with the equal radii AB, ab, let the

BC, b c, be deſcribed from the one leg to the other of the angles reſpectively. Then the angle DAE : the angle d a e::the arc BC : the arc b c.

Conceive the angle DAE to be ſo divided into equal parts, that the angle d a e may either be a multiple of one of thoſe parts, or be indefinitely near it.

Then the arc BC will be divided into equal ſmall arcs, the number of which ſhall be equal to the parts into which the angle DAE was divided; (corol. to prob. 5.) and the arc b c ſhall be the ſame multiple of one of the parts of the arc BC, as the angle d a e is of one of the parts of the angle DAE.

Therefore as the number of equal parts in the angle DAE, is to the number of the ſame equal parts in the angle d ae. So is the number of equal parts in the arc BC, to the number of the ſame equal parts in the arc b c. (Theo. 5. ſect. 1.)

But the number of parts in an angle, conſtitute the angle itſelf; and the number of parts in an arc, conſtitute the arc itſelf.

Whence, As the angle DAE : the angle d ae::the arc BC : the arc b c.

Which was to be proved.

Scholium. In the practical admeaſurement of angles, every circle is ſuppoſed to be divided into 360 equal parts called degrees, which degrees are again divided each into 60 equal parts called minutes, and thoſe minutes again each into 60 equal parts called ſecond minutes, or more commonly ſeconds, beyond which the diviſion is ſeldom carried, though ſeconds are on ſome occaſions divided in the ſame ſexagenary manner into thirds, fourths, &c. and ſometimes they are decimally divided into tenths, &c.

THEOREM XI.

The peripheries of circles are in proportion to their radii. Fig. 33.

Demonſtration. Let ADBE be a circle, whoſe center is C, and a d b e any other circle having the ſame center.

Draw the diameter [illegible], DE, at right angles to each other, and by continual [illegible] angles, conſtitute an indefinitely great n[illegible]gles meeting in C. The peripher[illegible] AD [illegible]ided into an indefinitely great [illegible]phery a d b e will be likew[illegible]ual parts. (Theo. 10[illegible]

Let GCA repreſent one of theſe indefinitely ſmall angles. Then GA will be an indefinitely ſmall part of the periphery of one circle, and g a will be a correſpondent part of the other circle. Theſe parts, on account of their ſmallneſs, may be taken for right lines.

The triangles GCA, gc a, will be iſoſceles, having a common angle at C, and therefore ſimilar. (Conſect. 2. prob. 2.)

Whence AC : ac::AG : ag, (theo. 9.) that is the radius of one circle is to the radius of the other, as the part of the one circle is to the part of the other. And the peripheries will be in the ſame ratio, becauſe they are like multiples of the parts. (By Theo. 5. ſect. 1.)

Which was to be proved.

Corollary. And becauſe the number of parts in each circle contained between any two common radii are equal, the lengths of the arcs of different circles, which meaſure equal angles, will alſo be as their radii.

THEOREM XII.

If any right line touches a circle, and a right line be drawn from the center to the point of contact, this line will be perpendicular to the tangent. Fig. 34.

Demonſtration. Let AB be a right line touching the circle DHE, in the point D; and DC a line drawn from the center C to the point of contact D. Then the line CD is perpendicular to AB.

For if CD be not perpendicular to AB, it will be poſſible to draw ſome other right line from the point C, which ſhall be perpendicular to AB. Suppoſe GC to be the right line.

Now becauſe the line AB (def. 20.) touches the circumference of the circle only in the point D; the point G will be at a diſtance from the circumference, and the line GC will be greater than CD.

The line CG was ſuppoſed to be perpendicular to AB: whence it follows in the triangle CGD, that the angle CGD being a right angle, the angle CDG muſt be leſs than a right angle. (Corol. 3. theo. 5.) And the ſide CG leſs than the ſide CD. (Corol. 1. theo. 7.)

But it was ſhewn that CG is greater than CD, and therefore the ſuppoſition which makes CD the greater cannot be true. It is not therefore true that CG is perpendicular to AB.

By the ſame argument it is ſhewn, that any other line drawn from C to a point in the line AB, remote from the periphery of the circle, will not be perpendicular to the tangent, even though the tangent ſhould be indefinitely continued.

A perpendicular let fall from C to the indefinite right line AB, will therefore be drawn to a point in AB, which is not remote from the periphery of the circle, namely to the point of contact D. That is the line CD will be perpendicular to AB.

Which was to be proved.

THEOREM XIII.

Any two quantities whoſe ſum and difference are reſpectively equal to the ſum and difference of any other two quantities, ſhall themſelves be equal, the greater quantity in the one couple, to the greater quantity in the other; and in like manner the leſs to the leſs. Fig. 35.

Demonſtration. Let the line AB repreſent the ſum of two quantities, and BC their difference. And let a b equal to AB, repreſent the ſum of two other quantities, and b c equal to BC their difference.

Join AB, BC, into one right line AC; alſo join ab, bc, into one right line a c. Biſect AC in D, and a c in d.

Then AD and DB are the two quantities whoſe ſum is AB, and whoſe difference is BC; for BC is the exceſs of AD above DB.

And a d and d b are the two other quantities whoſe ſum is a b, and whoſe difference is b c.

Now AC is equal to a c, (by axiom 1) as being the ſums of AB, BC, and a b, b c, which are reſpectively equal. Conſequently the halves AD, ad, are equal. (Axiom 4.)

And if the equals AD, ad, be taken from the equals AB, a b, the remainders DB, d b, will be equal. (Axiom 2.)

Therefore the greater quantity A D in one couple, is equal to the greater quantity ad in the other couple, and in like manner the leſs DB to the leſs d b.

Which was to be proved.

THEOREM XIV.

If to half the ſum of any two quantities be added half their difference, that ſum ſhall be equal to the greater quantity; but if from half the ſum of any two quantities be taken half their difference, that remainder ſhall be equal to the leſſer quantity. Fig. 36.

Demonſtration. Let the line AB repreſent the ſum of two quantities AD, DB, of which AD is the greater.

Biſect AB in C, and from A ſet off A b equal to DB.

Then

Then b D is the difference of the two quantities; for it is the exceſs of AD above A b, which laſt is equal to DB.

From AC take A b, and from BC take DB; the remainders b C, DC, will be equal. (Axiom 2.) DC thererore is half the difference.

Now CD added to AC, is equal to AD; and CD taken from CB leaves DB.

That is half the difference added to half the ſum, is equal to the greater quantity; and half the difference taken from half the ſum, leaves the leſſer quantity.

Which was to be proved.

BOOK

BOOK I.

SECT. III. OF TRIGONOMETRY.

CHAP. I.

OF THE LINES DRAWN ABOUT ANGLES; AND OF THE CONSTRUCTION AND USE OF THE LINES ON GUNTER'S SCALE.

IT has already been remarked, (ſchol. to theor. 10) that angles are meaſured by the arcs they comprehend, and that in order to denote the quantity of any given angle or its meaſuring arc, a circle was ſuppoſed to be divided into 360 degrees, every degree into 60 minutes, every minute into 60 ſeconds, and ſo forth. There are many inſtruments for the mechanical admeaſurement of angles, whoſe principal part is a circle, or part of a circle, ſo divided. For if the centre of the circle be applied to the angular point, the number of degrees, minutes, &c. intercepted between the legs, denotes the quantity of the angle. And in this operation it is obviouſly of no conſequence whether the radius of the circle be larger or leſs, excepting only that the diviſions are more diſcernible in a larger circle, becauſe an angle is not altered by prolonging or ſhortening its legs, neither is the number of degrees greater or leſs in one circle than another, every degree being the 360th part of the circle to which it belongs.

But in moſt caſes it is required to find lines or angles whoſe actual admeaſurement is either very difficult or impracticable. Theſe may be diſcovered by the relations they are known to have to other given lines or angles, a calculation being inſtituted for that purpoſe. And as the compariſon of one right line to another is exceedingly more convenient and eaſy, than the compariſon of a right line to a curve, it has been found advantageous to meaſure the quantities of angles, not by the arc itſelf, which is deſcribed on the angular point, but by certain right lines deſcribed about that arc.

If an arc be deſcribed meaſuring any right lined angle, a right line joining the extremities of the arc is termed the chord of the angle. Thus the angle BAC being meaſured by the arc DE, the right line DE is its chord. Fig. 37.

If a perpendicular be let fall from one extremity of the meaſuring arc to the oppoſite leg, prolonged if need be, that perpendicular is termed the right ſine, or more commonly the ſine of the angle. Thus the angle BAC being meaſured by the arc DE, the perpendicular DF is its ſine. Fig. 38.

The right line comprehended between the diſtant extremities of the meaſuring arc and ſine, is termed the verſed ſine. Thus FE is the verſed ſine.

If a perpendicular be raiſed upon one of the legs of the angle from that point upon which the meaſuring arc falls, and be continued till it meets the other leg, prolonged if neceſſary, this perpendicular is called the tangent of the arc. Thus the angle BAC being meaſured by the arc DE, the perpendicular EG is its tangent. Fig. 39.

That leg of the angle which after paſſing, or cutting the meaſuring arc, meets the tangent, is called the ſecant of the angle; or the ſecant of the angle is the longer of the two legs which are comprehended between the tangent and the angular point. Thus AG is the ſecant. Fig. 39.

It is obvious that in making uſe of theſe lines we muſt always uſe the ſame radius; becauſe otherwiſe there would be no ſettled proportions amongſt them.

The difference between any angle and 90° is called its complement; and the quantity which any angle wants of 180° is called its ſupplement. The ſine, tangent, and ſecant of any complemental angle, are called the ſine complement or coſine, tangent complement, or co-tangent, and ſecant complement or co-ſecant of the angle to which the given angle is complemental.

Thus in the angle BAC, fig. 40. the leg AC being prolonged towards the ſemicircle ED e c, deſcribed on the angular point, the perpendicular A e raiſed: Then the angle e AB is the complement, and c AB is the ſupplement of BAC. And in the angle BAC, DF is the ſine, FE the verſed ſine, EG the tangent, and AG the ſecant. And again, FA or Df is the coſine, eg the co-tangent, and A g the co-ſecant of the ſame angle. The ſine of the ſupplemental angle c AD is the ſame as that of the angle itſelf.

From the contemplation of this figure, and the properties of triangles already demonſtrated, it is eaſily infered that the Radius is equal to

The Chord of 60°.
The Sine of 90°.
The verſed ſine of 90°.
The tangent of 45°.
The ſecant of 00°.

The triangle DAF contained by the ſine, coſine, and radius, will not have its angles altered by altering the radius; conſequently it will always be ſimilar to itſelf, and to the triangle GEA, contained by the tangent, radius, and ſecant. The ſine, verſed ſine, tangent and ſecant of a given angle, will therefore be reſpectively in the ſame proportion to the radius, whether that radius be taken larger or leſs. And the ſame is readily determined of the cotangent and coſecant, becauſe the triangle e g A will not have its angles altered by altering the radius. From which it follows, that if any given radius be divided into 10,000000, &c. equal parts, and the ſine, tangent, ſecant, &c. of any angle be found in ſuch parts, the numbers will likewiſe expreſs the lengths of the ſine, tangent, ſecant, &c. of the ſame angle, to any other radius in like parts of that other radius.

Tables of ſines, tangents, ſecants and verſed ſines, are conſtructed to every degree and minute of the quadrant, or quarter of a circle to a radius of 10,000, &c. the radius being made to conſiſt of a greater number of parts according to the exactneſs required. Theſe numbers are called the natural ſines, tangents, ſecants and verſed ſines, in contradiſtinction to their ſeveral logarithms, which are called artificial ſines, tangents, ſecants, and verſed ſines. Theſe laſt only, namely, the ſines, tangents, and ſecants, as being much more generally uſeful, are found at the end of this treatiſe.

Our preſent purpoſe does not require an explanation of the methods of conſtructing theſe tables, or of finding the ſines, tangents, &c. numerically; but we ſhall mention their geometrical conſtruction, it being neceſſary for underſtanding the uſe of Gunter's Scale.

The Gunter's Scale is uſually a flat ruler, of the length of two feet; on one ſide of which are graduated ſeveral lines, which may be termed natural ſcales; and on the other ſide various other artificial or logarithmic ſcales.

The ſide containing the natural ſcales is divided into two equal parts by a line drawn acroſs the middle. One of theſe parts is filled with ſcales of equal parts, marked 60, 50, 45, 40, &c. at the beginning; the numbers denoting how many parts of each ſcale is contained in an inch. Theſe ſcales are uſed for meaſuring right lines, and are of ſuch various lengths for the convenience of drawing any figure of a larger or ſmaller ſize, as may be required. The other half or part chiefly contains ſcales of lines neceſſary for meaſuring angles; namely, lines of chords marked Cho. of ſines marked Sin. of tangents marked Tan. of ſemi-tangents marked S. T. and of ſecants marked Sec. this laſt being uſually on the ſame line as the ſines, becauſe its graduations do not begin till the ſines end.

Geometrical conſtruction of the ſcale of chords, ſines, tangents and ſecants. Fig. 41. With any radius AB deſcribe the quadrant BC, and erect the perpendiculars AD, BE, unlimited towards D and E. Divide the arc BC into degrees and minutes, as the magnitude of the radius may admit. Draw the chord BC. Then arcs deſcribed on the center B thro' each point of diviſion, will divide the right line BC into a line of chords; right lines drawn thro' the ſame points parallel to BA, will divide AC into a line of ſines; right lines drawn from the point A, thro' each of the ſame points, will divide BE into a line of tangents; and laſtly, arcs deſcribed on the center A, thro' each diviſion of the tangent, will divide AD into a line of ſecants.

There are two other ſcales, namely the rhumbs marked Rum. and longitude marked Lon. The rhumbs is a line of chords conſtructed to a quadrant divided into eight parts or points of the compaſs; and the line of longitudes is a line divided into ſixty unequal parts, and ſo applied to the line of chords, as to ſhew by inſpection the number of equatorial miles contained in a degree, on any parallel of latitude. It will be more proper to ſpeak of this line hereafter.

The artificial or logarithmic ſcales, are the line of numbers marked Num. of ſines marked Sin. of tangents marked Tan. of verſed ſines marked V. S. of ſine rhumbs marked S. R. of tangent rhumbs marked T. R. a line marked Mer. or meridian, and another marked E. P. which ſignifies equal parts. The uſual diſpoſition of theſe lines upon the ſcale, is not in the order we have here made uſe of in enumerating them; but it will be neceſſary for the reader to have a Gunter's ſcale before him, in order to underſtand the following account of them.

The line of numbers is compoſed of the logarithms of numbers, applied to a right line thus. Let a line of the propoſed length of the line of numbers, be divided into two equal parts, and thoſe parts again ſubdivided into tenths, &c. as may be required. The length of the line of numbers is from the extreme 1 on the left hand, to 10 on the right; and in the line of equal parts thus prepared, the two halves are conſidered as integers; the ſubdiviſions will conſequently expreſs decimal fractions. From the line of equal parts take the fraction 0.30103, which is the logarithm of the number 2, and ſet it from the extreme 1 on the line of numbers, and it will give the diviſion marked 2. The logarithm of 3, taken and ſet off in the ſame manner, will give the diviſion 3. And thus by the help of a table of logarithms, and the ſcale of equal parts, may the whole line be divided; becauſe the logarithm of any number ſet off in this manner, will give its point of diviſion.

This artificial line of numbers conſiſts of two halves or parts, the diviſions of each of which are in effect the ſame. So that if the firſt ſet of primary diviſions be called 1, 2, 3, &c. the ſecond or following ſet will denote 10, 20, 30, &c. and if the ſecond be called 1, 2, 3, &c. the firſt or preceding ſet will denote the decimal fractions .1, .2, .3, &c. and the ſmaller diviſions will be valued accordingly. That is to ſay in general, the diviſions on the right hand half of the line of numbers will always denote ten times as much as the like diviſions in the other half. All which is very clear from what has already been treated concerning logarithms.

The line of numbers, therefore, is a table of logarithms, the uſefulneſs and accuracy of which is greater, the more numerous and exact the diviſions. For ſince the multiplication of numbers is performed by the addition of their logarithms, if the logarithm of any number, or the extent from 1 to that number be taken between the compaſſes, and applied towards the right hand from any other number, it will exhibit the ſum of the logarithms of the two numbers: that is, the right hand point of the compaſſes will fall upon a number which is the product of the two aſſumed numbers. And ſince the diviſion of numbers is performed by the ſubtraction of their logarithms, if the logarithm of any number be in like manner taken and applied to the left hand from any other number, it will exhibit the difference of the logarithms of the two numbers; that is, the left hand point of the compaſſes will fall upon a number which is the quotient of the latter number by the former, whoſe logarithm was taken between the compaſſes: in which caſe, if the left hand point of the compaſſes fall to the right of 1 from which the numbers begin, the remainder is a poſitive logarithm, and the quotient is greater than unity; but if it fall to the left of 1, the remaining logarithm is negative, and the quotient is fractional, or leſs than unity; the former quotient being produced by the diviſion of a greater number by a leſs, and the latter by the diviſion of a leſs number by a greater. Or otherwiſe, ſince all the numbers on the ſcale begin from the ſame point, it is evident that the diſtance between any two numbers will be the difference of their diſtances from

1, that is of their logarithms; if therefore the diſtance between any two numbers be taken by the compaſſes, and applied to the right hand from 1, the right hand point will fall upon the quotient, which will be more than unity, if the leſs number be taken as diviſor; but if not, it will be the denominator of a fraction whoſe numerator is 1; or the decimal value of the ſame fraction may be obtained by applying the ſame extent to the left hand of 1.

Examples of Multiplication and Diviſion by the Line of Numbers.

It is required to multiply 4.6 by 7.

The Operation. Take the extent from 1 to 7 in the compaſſes; ſet one foot at the diviſion of 4.6, and without altering the opening of the legs, place the other on the line to the right hand. It will fall between the diviſions 32 and 33, about 1-5th part of a diviſion beyond 32. The product therefore is 32.2.

Let 36 be multiplied by 9,

The Operation. Take the extent from 1 to 9 in the compaſſes; ſet one foot at the diviſion of 36, and without altering the opening of the legs turn the other to the right: it will fall without the ruler. To remedy this inconvenience it is to be remembered that the multiplication of 3.6 by 9 will give the ſame figures in the product as 36 by 9. Set therefore one foot at 3.6 and turn the other to the right, and it will fall ſomewhat leſs than half a diviſion beyond 32, that is at 32 4. But as we have ſuppoſed a decimal in the multiplicand, which is not in reality ſuch, we muſt reject the decimal point in the product, which conſequently is 324.

Multiply 64 by 28.

The Operation. Find the product of 6.4 by 2.8, as already ſhewn; but in the reading it off, place the firſt figure two removes higher in value than the ſcale denotes, becauſe of the two ſuppoſed decimals. The product read in this manner will be the product of 64 by 28. Thus the right hand point of the compaſſes with the extent 2.8, reaches from 6.4 to 17.9, and ſomewhat more; but in reading off, the firſt figure is taken from the tens place two removes higher, namely, to the place of thouſands, and the product is read 1790.

Multiply .5 by 3.

The Operation. Find the product of 5 by 3, as already ſhewn; but in reading off, place the firſt figure one remove lower than the ſcale denotes, becauſe the decimal .5 has been taken as a whole number. That is, inſtead of 15 read 1.5.

Divide 6 by 2.

The Operation. Take the extent from 1 to 2 in the compaſſes. Set one foot at the diviſion 6, and without altering the opening of the legs, turn the other to the left. It will fall on the diviſion 3, which number is the quotient. Or, take the diſtance between 3 and 6, and apply it towards the right hand from 1, the right hand point will fall on the number 3, which is the quotient.

Divide 174 by 8.

The Operation. Becauſe 17.4 divided by 8 gives the ſame figures in the quotient as 174 divided by 8, take the extent from 1 to 8, and ſet it to the left of 17.4, the quotient will be very near 2.2, which call 22, becauſe of the ſuppoſed decimal in the dividend. Or otherwiſe, take the diſtance between 8 and 17.4, and ſet it to the right hand from 1, the quotient will be 2.2, as before.

Divide 6 by 72.

The Operation. The extent between 1 and 7.2 being taken, and ſet to the left of 6, falls without the ruler; but becauſe both the halves of the ruler are perfectly alike, ſet it from the ſecond 6, and the left foot of the compaſſes will fall at 83 to the left of 1, which being a decimal fraction muſt be read .83. But becauſe we have ſuppoſed a decimal place in the diviſor, which is not really ſuch, the quotient will be .083. Or otherwiſe, take the diſtance between 72 and 6, which ſet to the right hand from 1, gives 12, the denominator of a fraction whoſe numerator is 1, that is $\frac{1}{12}$, whoſe decimal value is ſomewhat more than .083.

But the chief uſe of this line of numbers is in proportion. For ſince every couple of numbers which produces the ſame quotient by dividing the conſequent by the antecedent, as any other couple in like manner produces, is in the ſame ratio; and ſince the quotient of two numbers on Gunter's line is denoted by the diſtance between them, it follows that every couple of numbers on Gunter's line, is in the ſame ratio with any other couple, the terms of which are diſtant by an equal interval with the former, provided they be taken the ſame way; that is, if the antecedent in one couple be to the right

or

or left hand of its conſequent, ſo likewiſe muſt the antecedent in the other couple be on the ſame hand or ſide of its conſequent.

Example. It is required to find a conſequent to the number 86, to which it ſhall be in the ratio of 3 to 5.

The Operation. The extent from 3 to 5 being taken, ſet one foot of the compaſſes at the ſixth diviſion beyond the firſt 8, conſidered as 80, and ſet the other towards the right hand, becauſe 5 is to the right hand of three, and it will fall a little beyond the number 143.

The line of ſines conſiſts of the logarithms of the ſines of degrees and their parts, laid off from the ſcale of equal parts, as was before explained in the conſtruction of the line of numbers, with this difference only, that for convenience its diviſions are laid off from the right hand extremity, by the arithmetical complements of the logarithms. It is uſeful for managing proportions into which the ſines enter.

The line of verſed ſines conſiſts of the logarithms of verſed ſines, and is conſtructed from the ſame ſcale of equal parts. But it is numbered in the contrary direction, the numbers expreſſing the ſupplements of the verſed ſines againſt which they ſtand. The uſe of this line is ſimilar to that of the ſines, but it is not wanted in any of the operations of plane trigonometry.

The line of tangents conſiſts of the logarithms of the tangents, laid off from the tangent of 45°, in the ſame manner as the ſines. But it is numbered backwards as well as forwards, becauſe the ſame diviſions, which by counting forwards ſerve for the degrees and minutes under 45°, do likewiſe ſerve by counting backwards for the degrees and minutes equally diſtant above 45°. For the radius or tangent of 45°, is a geometrical mean proportional between the tangent and cotangent of any angle, as is evident from the following proof.

In fig. 40, EG is the tangent of the angle BAC, and eg is its co-tangent; that is, the tangent of an angle as far remote from 45° on the one ſide, with reſpect to exceeding or falling ſhort, as BAC is on the other. Now in the triangles EAG and eAg, the angles at E and e are right angles. The angles GAE, EGA, are together equal to a right angle. (Corol. 2. theor. 5.) And by the conſtruction of the figure the angles GAE, eAg, are together equal to a right angle. From each ſum take away the common angle GAE, and the remaining angles EGA, eAg, will be equal. Therefore by (corol. 1. theo. 5.) the triangles EAG, eAg, are ſimilar. Whence (theo. 9.) EG:EA::eA:eg. That is the tangent is to radius, as radius to the contangent.

It follows therefore from the nature of theſe lines of logarithms, that the diſtance between the tangent and radius, or 45°, will be equal to the diſtance between radius and the contangent. So that if the line of tangents were continued beyond 45°, the diviſions would be exactly the ſame, but in a reverſed order, as thoſe which precede 45°. Whence it is obvious, that the purpoſe of ſuch a continuation may be anſwered by counting the diviſions back again. But it is to be remembered, that with reſpect to the poſition of the antecedents and conſequents, the higher part of the line of tangents is to be conſidered as if it were really continued forward, towards the right hand, and therefore every ſuperior number muſt be ſuppoſed to lie to the right of an inferior, as in the other part of the line.

The lines of meridians and of equal parts are uſeful in the conſtruction of charts, according to Wright's, or as it is commonly called, Mercator's Projection. It will for that reaſon be proper to defer the explanation of its nature and application, till we come to treat of the principles on which it depends.

CHAP. II.

THE FOUR FUNDAMENTAL THEOREMS OF PLANE TRIGONOMETRY.

THEOREM I.

IN every right angled plane triangle, if the hypothenuſe be aſſumed as radius, the ſides containing the right angle will be the ſines of their oppoſite angles: or if one of the ſides containing the right angle be aſſumed as radius, the hypothenuſe will be the ſecant of the acute angle contiguous to the aſſumed ſide, and the other ſide will be the tangent of the ſaid acute angle. Fig. 42.

Demonſtration. Let ABC be the given triangle.

With the hypothenuſe AB as radius, deſcribe the arcs BD and AE, interſecting the ſides BC and AC prolonged, and it is obvious that BC will be the ſine of the angle BAC, and that AC will be the ſine of the angle ABC.

But if AC be taken as radius, and the arc CF be deſcribed, it is likewiſe evident that BC is the tangent, and AB the ſecant of the angle BAC, which is contiguous to the aſſumed ſide AC.

And by the like proceeding, taking BC as radius, AC is ſhewn to be the tangent, and AB the ſecant of the angle ABC.

THEOREM II.

In every plane triangle, the ſides are in proportion to the ſines of their oppoſite angles. Fig. 43.

Demonſtration. Let ABC be the given triangle.

Aſſume BC, one of the ſides, as radius; from each extremity of which let fall the perpendiculars BE, CD, on the other ſides, continued if need be.

In AB, one of theſe two ſides, from the angle A, not adjacent to BC, ſet off AF equal to BC, and let fall the perpendicular FG on the other ſide.

Now DC is the ſine of the angle ABC; BE is the ſine of the angle BCA; and FG is the ſine of the angle BAC, to the common radius BC.

And the triangles AFG, ABE, and ACD, are ſimilar; for they are all right-angled, and have a common angle A. (Corollary 1, to theor. 5, and ſchol. to theor. 9.)

It will therefore be, As AF, or its equal BC, is to FG, ſo is AB to BE, and ſo is AC to CD. (Theor. 9.)

Or, more fully,

As BC the ſide
Is to FG, the ſine of its oppoſite angle,
So is AB, the ſide,
To BE, the ſine of its oppoſite angle.
And ſo is AC, the ſide,
To CD, the ſine of its oppoſite angle.
Which was to be proved.

THEOREM III.

In every plane triangle, the ſum of any two ſides is to their difference, as the tangent of half the ſum of the angles not included between the two aſſumed ſides, is to the tangent of half the difference of thoſe angles. Fig. 44.

Demonſtration. Let ABC be the given triangle, and let AB, BC, be the aſſumed ſides. Continue one of the aſſumed ſides AB, from the angle B, formed between them, till BD is equal to the other aſſumed ſide BC; AD will then be the ſum of the two ſides AB and BC.

Biſect AD in the point F, and FB will be half the difference of the ſame two ſides; for it is the exceſs of the longer ſide AB above the half ſum AF.

Draw the right line CD; which biſect in E. Draw the lines BE and FE, and parallel to FE thro' the point B, draw BG.

FE, and conſequently BG, is parallel to AC; for FE by the conſtruction, cuts the ſides AD and DC, of the triangle ADC proportionally. (Corol. to Theo. 8.) The angle DBG is therefore equal to the angle DAC. (Theo. 3.)

The angle DBC is equal to the ſum of the two internal oppoſite angles BAC and BCA. (Theo. 6.) And by reaſon of the congruity of the triangles DBE and CBE, the angle DBE is equal to half that ſum.

Therefore the angle GBE, is half the difference between the angles BAC and BCA, for it is the exceſs of half their ſum above the angle BAC, or its equal DBG.

The angles BED and BEC, being equal in the congruous triangles DBE and CBE, the line BE is perpendicular to DC. (Def. 11.) If BE then be taken as radius, ED will be the tangent of the angle DBE, or half the ſum of the angles not included between the aſſumed ſides; and EG will be the tangent of the angle GBE, or half the difference of the ſame angles.

Wherefore becauſe the ſides DF and DE of the triangle DEF, are cut by the line BG parallel to FE, it will be as DF, or half the ſum of the ſides AB and BC, is to BF, or half the difference of the ſame ſides; ſo is DE, or the tangent of half the ſum of the angles not included between them, to GE, or the tangent of half their difference. (Theo. 8.)

But ſince wholes muſt have the ſame proportion as their halves, it will follow that,

The ſum of any two ſides

Is to their difference,

As the tangent of half the ſum of the angles not included between the two aſſumed ſides,

Is to the tangent of half the difference of thoſe angles.

Which was to be proved.

THEOREM IV.

In every plane triangle, the baſe or longeſt ſide is to the ſum of the legs, as the difference of the legs is to the difference of the ſegments of the baſe, made by letting fall a perpendicular from the oppoſite angle. Fig. 45.

Demonſtration. Let ABC be the given triangle.

From the angle B oppoſite the baſe, continue the longer leg AB, till BD is equal to BC. Join CD.

From B towards A, upon BA, ſet off B c equal to BC.

AD will then be the ſum of the legs AB and BC; and Ac will be their difference.

From the angular point B, let fall the perpendicular BE, upon the baſe AC.

From E towards A, upon EA, ſet off Ed equal to EC.

Ad will then be the difference of the ſegments EC and EA of the baſe.

Laſtly, Join Bd and cd.

The triangles Acd, ACD, are ſimilar. For

The angle A is common to both, and the ſum of the angles Acd, Adc, is equal to the ſum of the angles ACD, ADC; becauſe thoſe ſums are reſpectively equal to the difference between the angle A and two right angles. (Theo. 5.)

And becauſe the triangles BEC, BEd, are congruous, Bd will be equal to BC, or its equal Bc. In the iſoſceles triangle Bdc therefore, the angles Bcd, Bdc, will be equal. (Conſect. 2. Prob 2.)

But the angle Bcd, as the external angle of the triangle Acd, will be equal to the ſum of the two oppoſite inner angles cAd, cdA; and by the ſame argument the angle cdE will be equal to the ſum of the angles cAd, dcA. (The. 6.)

Now the difference between the external angles Bcd, cdE, is equal to the difference between the aforeſaid reſpective ſums, and that difference will not be altered by previouſly ſubducting the common angle cAd from each ſum. The angle BdE is equal to the difference between the external angles: for it is the exceſs of cdE above cdB, which laſt is equal to Bcd. (Conſect. 2. Prob. 2.)

Conſequently the angle BdE is equal to the difference between the angles dcA and cdA.

Again, in the triangle ACD, the difference between the angles DCA and CDA, is equal to the angle BCE, or the exceſs of DCA above DCB, which laſt is equal to BDC, by reaſon of the equality of the ſubtending ſides BC and BD. (Conſect. 2, prob. 2.)

But the angles BCE, BdE, are equal on account of the congruity of the triangles BCE, BDE.

It has been proved, reſpecting the angles cdA, dcA, in the triangle Acd, and the angles CDA, DCA, in the triangle ACD, that their ſums are equal, and alſo their differences. The angles themſelves are therefore equal; the greater in one couple to the greater in the other, and the leſs in like manner to the leſs. (Theor. 13.) The line AB is leſs than Ad added to dB, (Def. 5.) from each take the equal lines cB and dB, and the remainder Ac will be leſs than the remainder Ad. The angle Acd is therefore greater than the angle Adc. (The. 7.) And the line AD being the ſum of AB and BC, is greater than the line AC. (Def. 5.) The angle ACD is therefore greater than ADC. (Theor. 7.)

Whence it follows, that the three angles of the triangle Acd, namely, Acd, Adc, dAc, are reſpectively equal to the three angles of the triangle ACD, namely ACD, ADC, DAC, and from the proportionality of their ſides, it is. (Theor. 9.)

As AC, the baſe,
Is to AD, the ſum of the legs,
So is Ac, the difference of the legs,
To Ad, the difference of the ſegments of the baſe, made by letting fall a perpendicular from the oppoſite angle.

Which was to be proved.

CHAP. III.

THE SOLUTION OF QUESTIONS IN PLANE TRIGONOMETRY.

ALL the caſes of Plane Trigonometry are numerically ſolved by the application of the four fundamental propoſitions already demonſtrated. Every triangle has three ſides and three angles, and if any three of theſe ſix things be given, the other three may in general be found, provided a ſide be among the things given.

EXAMPLE I. Fig. 46.

In the plane triangle ABC, there is given,
The ſide AB = 50 yards
Side AC = 36 yards
Angle C 90°
To find the reſt.

The Conſtruction, or Linear Solution.

Draw an unlimited faint line, upon which ſet off AC = 36, from a ſcale of equal parts.

From C, with the chord of 60° or radius, taken from the line of chords, deſcribe an arc, interſecting CA, continued if need be.

From the point of interſection a, ſet off ab = 90°, taken from the line of chords.

Through the points C and b draw a right line unlimited towards b.

From the point A, with the extent 50, taken from the ſcale of equal parts, deſcribe an arc, interſecting Cb in B.

Join AB; and ABC ſhall be the triangle required.

The extent CB being applied to the ſcale of equal parts, will ſhew the length of that ſide; and the arcs g n, d e, being deſcribed with the chord of 60°, from the angular points B, A, the extent from g to n, applied to the line of chords, will ſhew the quantity of the angle B, and the extent from d to e will, in like manner, ſhew the quantity of the angle A.

It is almoſt unneceſſary to remark that the ſame ſcale of equal parts muſt be uſed throughout, in the deſcription of any figure.

The Computation, or Numeral Solution.

For the more ready performance of the numeral ſolution of any trigonometrical queſtion, it is convenient to make a rough draught by the hand of the triangle under conſideration, and mark the things which are given, namely ſides, with a little daſh acroſs them, and angles by a little arc between the legs of the angle. Thus if the figure already conſtructed be ſuppoſed to ſtand for the rough draught, the little daſh acroſs the ſides AB and AC, and the little arc in the angle C, denote that thoſe ſides and angles are given.

By contemplating the figure thus marked, it will not be difficult to determine which of the four fundamental theorems is applicable to its ſolution. If the triangle be right-angled, the firſt theorem is to be uſed; if oblique-angled, and there be a ſide and its oppoſite angle among the things given, the ſecond theorem is to be uſed; if oblique-angled, and the things given be two ſides and the angle included between them, the third theorem muſt be uſed; and when all the ſides of an oblique-angled triangle are given to find the angles, the fourth theorem muſt be uſed. But this is not to be underſtood as if there were but one theorem to be made uſe of in one queſtion; for in moſt caſes, in which the third or fourth theorems are uſed, the firſt or ſecond are likewiſe required; as will be more eaſily ſeen in the examples.

In ſtating the proportions, if the thing ſought be a ſide, begin the ſtating with an angle; but if an angle be required, begin with a ſide.

To find the angle B. By theorem 1.

Side $AB=50$. ar. co.	8.30103
: Radius, or ſine 90°	10.00000
:: Side $AC=36$	1.55630
: Sine $\angle B=46^\circ\ 03'$	9.85733

To find the ſide CB.

Radius or ſine 90°	10.00000
: Side $AB=50$	1.69897
:: Sine $\angle A=43^\circ\ 57'$	9.84148
: Side $BC=34.7$	1.54035

The angle B being known, the remaining angle A may be found by ſubtracting the ſum of the angles B and C from 180°, or two right angles, becauſe the three angles are equal to two right angles.

$\angle B+\angle C=46^\circ\ 03' + 90^\circ = 136^\circ\ 03'$.

And $180^\circ - 136^\circ\ 03' = 43^\circ\ 57'$ = angle A.

But in a right-angled triangle, the acute angles are = 90°, and therefore are complemental to each other. Whence, if one acute angle be given or found, the other may be had by ſubtracting the known acute angle from 90°.

That is, $90^\circ - 46^\circ\ 03' = 43.57 = \angle B$, as before.

In the firſt of theſe two ſtatings, the arithmetical complement of the logarithm of the firſt term was taken as directed in page 20; in the ſecond ſtating it was obviouſly unneceſſary, the ſubtraction of the logarithmic ſine of radius being ſhorter.

The Solution by Gunter's Scale.

Becauſe the lines on Gunter's ſcale are ſo conſtructed, that they (except the line of numbers) only expreſs the logarithms of particular ſeries of numbers, namely of the lengths of ſines, tangents, &c. it is neceſſary in uſing it, that the antecedent and conſequent whoſe diſtance is to be taken by the compaſſes, ſhould both be ſuch as to be found on the ſame line. If this be not the caſe in the ſtating of the queſtion propoſed for ſolution, it may be eaſily made ſo by tranſpoſing the ſecond and third terms. (Corol. 1. theo. 4. ſect. 1.) Thus in the firſt ſtating of the preſent example, tranſpoſe the ſecond and third terms, that is, make ſide AC the ſecond term and radius the third, and

The extent from 50 to 36, on the line of numbers being taken and applied from 90° on the line of ſines towards the left hand, (becauſe 36 lies to the left of 50) the point of the compaſſes falls a little to the right of 46°.

And in the ſecond ſtating, the extent from 90° to a little leſs than 44° on the line of ſines, will reach the ſame way from 50 to ſomewhat more than 34½, on the line of numbers.

EXAMPLE II. Fig. 47.

In the plane triangle ABC there is given
The ſide AC = 826 feet
Angle A = 47°.13′
Angle C = 32°.54′
To find the reſt.

Conſtruction.

On an unlimited faint line ſet off AC = 826, from a ſcale of equal parts.

From the extremities A and C with the radius 60°, from the line of chords, deſcribe arcs cutting the unlimited line in d and e.

From d towards g, and from e towards n, upon the arcs reſpectively ſet off the chords of the angles C and A, and thro' the points g, n, draw the lines C g, A n, interſecting each other in B.

ABC will be the triangle required.

The lengths of AB, CD, may be known by applying them to the ſcale of equal parts; and the meaſure of the angle A may be found by deſcribing with the radius 60°, an arc interſecting the legs BA and BC, prolonged if neceſſary. If an arc exceeds 90°, it muſt be meaſured at twice, and the ſum of the parts taken, as m o, o p. An obtuſe angle may likewiſe be conſtructed, by firſt ſetting off 90, and afterwards its exceſs above 90°.

Since the readieſt way of conſtructing a given angle by the ſcale and compaſſes, is by ſweeping an arc with the chord of 60°, and ſetting off its quantity from the line of chords; and contrarywiſe, ſince the quantity of any angle may be readily meaſured by deſcribing an arc from the angular point with the chord of 60°, and meaſuring the chord of the part intercepted between the legs; it muſt be underſtood in the following part of this work, when we ſay conſtruct or make an angle of a certain number of degrees, that the firſt of theſe operations muſt be performed, and when an angle is directed to be meaſured, the ſecond method is to be made uſe of.

Computation.

Becauſe there are two angles known, the third may be found by taking the ſupplement of their ſum. That is $180^\circ - \overline{\angle A + \angle C} = 180^\circ - 80^\circ\ 07' = 99^\circ\ 53' = \angle B$.

Here the triangle is oblique, and there is a ſide and its oppoſite angle among the things known. The ſecond fundamental theorem muſt therefore be uſed.

To find the ſide AB, begin an angle.

Sine ∠B=99° 53′ ar.co.	0.00649
: Opp. ſide AC=826	2.91698
:: Sine ∠C=32° 54′	9.73494
: Opp. ſide AB∠454.8	2.65841

To find the Side BC.

Sine ∠B=99° 53′ ar.co.	0.00649
: Side AC=826	2.91968
:: Sine ∠A=47° 13′	9.89565
: Side BC=615.4	2.78912

In theſe proportions the ſine of the ſupplement of 90° 53′ is taken; for the ſine of an obtuſe angle is the ſame as the ſine of its ſupplement. (Page 38.) The arithmetical complement of any logarithm ſine may be had without the trouble of ſubtracting the figures from 9, by taking 10. from the index of the co-ſecant. For radius is a geometrical mean proportional between the ſine and co-ſecant, as may be proved from the ſimilar triangles DFA and A e g. Fig. 40.

That is ſine×co-ſecant=rad.×rad. Or log. ſine+log. coſec.=log. rad.+log. rad.=10.+10. Whence log. coſec.—10.=10.—log. ſine=arithmetical complement of the log. ſine.

Solution by Gunter's Scale.

The extent from the ſupplement of 99° 53′, that is from 80° 07′ to 32° 54′ on the line of ſines, will reach the ſame way from 826 to 455 on the line of numbers.

And the extent from the ſame ſupplement, or 80° 07′ to 47° 13′ on the line of ſines, will reach the ſame way from 826 to 615 on the line of numbers.

When numbers conſiſt of more than two places of figures, the value of the figures below the firſt figures, can only be had by eſtimation on the Gunter's ſcale, which are uſually made. This eſtimation may ſerve very well for one lower figure, but not farther.

EXAMPLE III. Fig. 48.

In the plane triangle ABC there is given
The ſide AB = 36 feet
Side AC = 27 feet
Angle A = 90°.
To find the reſt.

Conſtruction.

Conſtruction.

On an unlimited line ſet off AC=27, and make the angle CAB=90°.

Make AB=36, and join BC.

ABC will be the triangle required, the parts of which may be known by admeaſurement.

Computation.

To find the angle C by theor. 1. making AC radius.	
Side AC=27	0.43136
: Rad. or tang. 45°	10.00000
:: Side AB=36	0.55630
: Tang. ∠C=53° 08′	10.12494

The comp. of which is 36o 52′ is = the ∠ B.

To find the Side BC, making BC radius.	
S. ∠C=53o 08′	9.90311
: Side AB=36	0.55630
:: Rad. or Sine 90o	10.00000
: Side BC=45	0.65319

Or to find the Side BC, making AC Radius.

Radius or ſecant 90	10.00000
: Side AC = 27	0.43136
:: Secant ∠ C = 53° 08′	10.22188
: Side BC = 45	0.65324

It is manifeſt from theſe proportions, that any ſide may be made radius; but in practice the hypothenuſe or ſide ſubtending the right angle, is always made radius when it can be done.

Solution by Gunter's Scale.

The extent from 27 to 36 on the line of numbers, will reach the ſame way from 45° to 53° 08′ on the line of tangents. For the part of the line of tangents which is above 45°, is to be conſidered as if it were continued out beyond 45 to the right hand, as has already been explained in page 37, and therefore the left hand muſt be taken for the right, and the right for the left, in uſing the numbers in that part.

Again, The extent from 53° 08′ to 90° on the line of ſeries, will reach the ſame way from 36 to 45, on the line of numbers.

The ſecants are ſo little uſed in computation, that they are not marked on Gunter's ſcale. But the line of ſines taken in the contrary direction from 90°, is a line of ſecants; namely of the complements of the ſines marked on the graduations. For becauſe the radius is a geometrical mean proportional between any ſine and its co-ſecant, as was obſerved at example 2, the ſame reaſoning may be applied to the ſines and co-ſecants, as was uſed concerning the tangents and co-tangents. Therefore

The extent from radius to on the line of ſines, to 36° 52′ the complement of 53° 08′, will reach from 27 to 45 on the line of numbers, which is taken to the right hand, becauſe the line of ſines was ſuppoſed to be reverſed, in order to make it a line of ſecants.

EXAMPLE IV. Fig. 49.

In the plane triangle ABC there is given
The ſide AB = 86 feet
Side AC = 100 feet
Angle C = 27° 12′
To find the reſt.

Conſtruction.

Make AC=100 feet, the ∠ at C=27° 12′, and draw Cb unlimited towards b.

From A with the extent 86, deſcribe an arc cutting C b, in B and b. Join AB and A b.

Either of the triangles ABC or A b C, will anſwer the conditions of the queſtion.

Hence it is apparent, that when there is but one angle of an oblique angled triangle given, together with two ſides not including the angle, if the ſide contiguous to the given angle be the longer of the two, the triangle will not be limited, unleſs it be mentioned whether the unknown angle not included by the given ſides be obtuſe or acute.

Computation.

To find the Angle B or b.

Side AB or Ab = 86 ar. co.	8.06550
: Sine ∠ C = 27° 12′	9.66001
:: Side AC = 100	2.00000
: Sine ∠ B = 147° 53′	9.72551
Or ∠ b = 32 07	

The Angles B and b are ſupplements of each other, having the ſame ſine.

To find the angle A, in the triangle ABC, in which the angle B is obtuſe.

$$180° - \overline{\angle B + \angle C} = \angle A.$$

$$\text{Or, } 180° - \overline{147° \, 53' + 27° \, 12'} = 4° \, 55'$$

To find the angle A, in the triangle AbC, in which the angle b is acute.

$$180° - \overline{\angle b + \angle C} = \angle A.$$

$$\text{Or, } 180° - \overline{32° \, 07'} + \overline{27° \, 12'} = 120° \, 41'$$

To find the ſide BC, in the triangle ABC.

Sine ∠C = 27° 12′ a. c.	0.33999
: Side AB = 86	1.93450
:: Sine ∠A = 4° 55′	8.93301
: Side BC = 16.12	1.20750

To find the ſide bC, in the triangle AbC.

Sine ∠C = 27° 12′ a.c.	0.33999
: Side AB = 86	1.93450
:: Sine ∠A = 120° 41′	9.93450
: Side bC = 161.8	2.20899

Solution by Gunter's Scale.

The extent from 86 to 100 on the line of numbers, will reach the ſame way from 27° 12′ to 32° 07′ on the line of ſines; which diviſion, from the nature of ſines, likewiſe anſwers likewiſe to 147° 53′, the ſupplement of 32° 07′.

Again, The extent from 27° 12′ to 4° 55′ on the line of ſines, will reach the ſame way from 86 to 16.1 on the line of numbers.

And the extent from 27° 12′ to 120° 41′ on the line of ſines, will reach the ſame way from 86 to nearly 162, on the line of numbers. The ſine of the ſupplement to 120° 41′ muſt be taken for its ſine, as has frequently been remarked concerning the ſines of obtuſe angles.

EXAMPLE V. Fig. 50.

In the plane triangle there is given
The ſide AB = 58 yards
Side BC = 79 yards
Angle C = 36° 10′
And the angle A is acute.
Required the other parts.

Conſtruction.

Conſtruction.

Draw an unlimited line AC; from any point of which C draw the line CB thro' the point C, forming the angle BCA = 36° 10′, and make CB = 79 yards.

From B with the radius BA = 58 yards, deſcribe an arc cutting AC in A and d.

From B to the point of interſection A, moſt remote from the given angle C, draw the line BC.

ABC will be the triangle required.

Computation.

To find the angle A.

Side AB = 58 ar. co.	8.23657
: Sine ∠ C = 36° 10′	9.77095
:: Side BC = 79	1.89763
: Sine ∠ A = 53° 30′	9.90515

To find the angle B.

∠ C = 36° 10′
∠ A = 53 30

89 40 ſum.

∠ B = 90 20 = 180° — ſum

To find the ſide AC.

Sine ∠ C = 36° 10′ ar. co.	0.22905
: Side AB = 58	1.76343
:: Sine ∠ B = 90° 20′	9.99999
: Side AC = 98.28	1.99247

Solution by Gunter's Scale.

The extent from 58 to 79 on the line of numbers, will reach the ſame way from 36° 10′ to 53° 30′ on the line of ſines.

And the extent from 36° 10′ to the ſupplement of 90° 20′ on the line of ſines, will reach the ſame way from 58 to 98¼ on the line of numbers.

EXAMPLE VI. Fig. 51.

In the plane triangle ABC there is given
The ſide AB = 230
Side BC = 107
Side AC = 316
To find the reſt.

Conſtruction.

Take the three ſides reſpectively from a ſcale of equal parts, and apply them to each other, according to prob. 1.

From B let fall the perpendicular upon BD the longeſt ſide.

Computation.

To find the difference of the ſegments AD, DC, of the baſe, by Theorem 4.

The baſe AC = 316 ar. co.	7.50031
: Sum of the legs AB + BC = 337	2.52763
:: Differ. of the legs AB − BC = 123	2.08990
: Diff. of the ſegments AD − DC = 131.2	2.11784

Now by theor. 14. ſect. 2. if to half the ſum of the ſegments be added half their difference, that ſum ſhall be equal to the greater ſegment.

AC = 316 ſum of the ſegments, and 158 = its half,
AD − DC = 131.2 diff. of the ſegments, and 65.6 = its half,

Greater ſeg. = ſum of the halves = 223.6 = AD.

In the right-angled triangle ABD.

Side AB = 230	2.36173
: Radius or ſine 90°	10.00000
:: Side AD = 223.6	2.34947
: Sine ∠ ABD = 76° 27′	998774.

Its complem. 13 33 = ∠ A.

The angle A being known, in the triangle ABC, the other angles may be found by theorem 2.

Side BC = 107 ar. co.	7 97062
: Sine ∠ A = 13° 33′	9.36976
:: Side AB = 230	2 36173
: Sine ∠ C = 30° 14′	9.70211

From 180° 00′
Take 43 47 = ∠ A + ∠ C = 13° 33′ + 30° 14′.

Remains 136 13 = ∠ ABC.

Solution by Gunter's Scale.

On the line of numbers the extent from 316 to 337, will reach the ſame way from 123. to 131.2.

Again, The extent from 230 to 223½ on the line of numbers, will reach the ſame way from 90° to 76½ on the line of ſines.

And the extent from 107 to 230 on the line of numbers, will reach the ſame way from 13° 33′ to 30° 14′ on the line of ſines.

EXAMPLE VII. Fig. 52.

In the plane triangle ABC there is given
The ſide AC = 542 miles
Side BC = 110 miles
Angle C = 100° 08′
To find the reſt.

Conſtruction.

Make AC=542 miles, and conſtruct the angle C=100° 08′.
Make CB=110 miles, and join AB.
ABC will be the triangle required.

Computation.

To find the unknown angles by theorem 3.

AC=542	From 180°
BC=110	Take 100.08=∠C
652=ſum of the ſides	79.52=ſum of the angles not included between the ſides.
432=diff. of the ſides	39.56=half ſum.

Sum of the ſides AC+CB=652	arith. co.	7.18575
: Their difference AC—CB=432		2.63548
:: Tang. $\frac{1}{2}$ ſum of ∠'s not includ. 39° 56′		9.92278
: Tangent $\frac{1}{2}$ their difference = 29° 01′		9.74401

The half ſum 39° 56+the half difference 29° 01′=the greater angle=68° 57′.

And the half ſum 39° 56′—the half difference 29° 01′=the leſſer angle=10° 55′ by theorem 14.

But the greater ſide AC is oppoſite the greater angle by theorem 7, and therefore ∠B is the greater angle, and ∠A the leſſer angle. That is ∠B=68° 57′, and ∠A 10° 55′. Whence

To find the ſide A by theorem 2.

Sine ∠B=68°.57	arith. co.	0.02999
: Side AC=542		2.73400
:: Sine ∠C=100° 08′		9.99317
: Side AB=569.8		2.75716

Solution by Gunter's Scale.

The extent from 652 to 432 on the line of numbers, will each the ſame way from 39° 56′ to 29° 01′ on the line of tangents.

And the extent from 68° 57 to the ſupplement of 100° 08′ on the line of ſines, will reach the ſame way from 542 to 570 on the line of numbers.

EXAMPLE VIII. Fig. 53.

In the plane triangle ABC there is given
The ſide AC = 46 fathoms
Side AB = 38 fathoms
Angle B = 57° 10′
To find the reſt.

Conſtruction.

Make AB = 38 fathoms, and the angle B = 57° 10.

From A with the radius 46 fathoms, deſcribe an arc cutting BC in C. Join AC.

ABC is the triangle required.

Computation.

To find the angle C.

Side CA = 46 ar. co.	8.33724
: Sine ∠ B = 57° 10′	9.92441
:: Side AB = 38	1.57978
: Sine ∠ C = 43° 57′	9.84143

To find the angle A.

∠ B = 57° 10′
∠ C = 43 57

Take	101 07	= ſum
From	180 00	
Rem.	78 53	= ∠ A.

To find the ſide BC.

Sine ∠ B = 57° 10′ ar. co.	0.07560
: Side AC = 46	1.66276
:: Sine ∠ A = 78° 53′	9.99177
: Side BC = 53.7	1.73013

Solution by Gunter's Scale.

The extent from 46 to 38 on the line of numbers, will reach the ſame way from 57° 10′ to 43° 57′ on the line of ſines.

And the extent from 57° 10′ to 78.53 on the line of ſines, will reach the ſame way from 46 to 53.7 on the line of numbers.

The foregoing examples are ſufficient to make the attentive learner acquainted with the uſe and application of the four fundamental theorems of plane trigonometry; and it is thought unneceſſary to make them more numerous, becauſe the whole of navigation affords continual practice for the ſtudent. Moſt writers on theſe ſubjects have claſſed their examples as much as poſſible, numbering under a ſeparate title every caſe in which the things are different; and it is uſual alſo to add a ſynopſis or table of all the various ſolutions which can be required. Experience ſhews that theſe are no real helps to the learner: for no one can be ſaid to be acquainted with trigonometry, until he has committed the enunciation of the four fundamental theorems to memory, and can apply them readily to any queſtion. But young people are moſt commonly deſirous of avoiding the trouble of thinking, and will ſeldom take the pains to commit the rules to memory, when they can be minutely informed by a ſynopſis how to ſtate a queſtion.

It is preſumed that the ſolutions here given by Gunter's ſcale, will make the reader perfectly acquainted with the method of working propoſitions on that inſtrument. For the ſake of brevity therefore, the inſtrumental ſolution of queſtions will not be added in the ſucceeding part of this treatiſe: but the young navigator is adviſed not to deſiſt from uſing this method, as it affords an eaſy and ſufficiently correct ſolution of moſt queſtions in navigation, and ſerves to confirm the truth of any other ſolution, which it would be much more troubleſome to examine any other way.

B O O K I.

Sect. IV. COSMOGRAPHY.

CHAP. I.

Of the FIGURE of the EARTH.

THE ſurface of the earth is compoſed of ſea and land, and its figure is nearly ſpherical. But its magnitude is ſo great, when compared with the quantity of ſurface which at any one time falls under our view, that we are not capable of determining its figure by inſpection, as we can with ſmaller bodies. Its ſphericity is proved by immediate and direct inferences from ſeveral obſervations.

It is the property of all fluids to acquire an uniform ſurface, which is uſually called level: for by reaſon of the weight of their parts, and the eaſe with which they are moved among each other in every direction, it happens that if any part be elevated above the reſt, it ſubſides and ſpreads over the ſurface till the level is obtained. In conſequence of this property the ſea is uniformly level, if we except thoſe minute irregularities which are occaſioned by the action of the wind. And, whatever may be the figure of this ſurface, it is evident from various obſervations, that the ſurface of the land is very nearly of the ſame figure. Few if any mountains are more than three miles above the level of the ſea. The extreme difference between the figure of the land and of the ſea, does not then exceed three miles; and this difference with reſpect to the known extent of the land, is no more in proportion to that extent, than a ſmall grain of duſt to a ſheet of paper, or the head of a nail to the ſhip's deck in which it is driven. The heights of lands above the level of the ſea, are diſcovered by trigonometrical calculations; but the obvious circumſtance of the courſes of rivers which run to the ſea in all directions over vaſt tracts of land, without acquiring that velocity of current which a conſiderable declivity could not fail to produce,

duce, is a ſufficient indication that thoſe lands are not much elevated. Since, therefore, the figure of the land agrees with that of the ſea, ſmall and caſual differences being rejected, it is clear that by diſcovering the figure of the latter, we ſhall from thence obtain that of the whole earth.

The level ſurface of water is not flat or plane, as we are apt to imagine from viewing a ſmall quantity. If an object, a boat for example, be viewed over a piece of calm ſtanding water, of more than a mile in length, with the aſſiſtance of a teleſcope, the eye of the obſerver being very little above the water, it will be ſeen that a part of the object only will appear in ſight, the reſt being hidden behind a convexity of the ſurface. And this hidden part will always be greateſt when the diſtance between the object and obſerver is greateſt. In like manner, at ſea, when a ſhip firſt appears in ſight from the maſt-head of another ſhip, it will not be viſible from the deck, becauſe the obſerver on the deck is prevented from beholding it by the convexity of the water, over which he who is at the maſt-head, by reaſon of his elevation, is capable of ſeeing. From hence is derived a rational method of eſtimating the diſtance of a ſhip which is in uſe among ſea-faring people; namely, of obſerving how low they can bring her down: that is to ſay, the man at the maſt-head fixes his eyes on the veſſel in ſight, and ſlowly deſcends by the ſhrouds, till ſhe becomes no longer viſible. The leſs the diſtance, the lower he may deſcend before ſhe diſappears. The convexity of the ſea is perhaps more ſtrikingly obſerved at ſun-ſet; for which intention nothing more is requiſite, than to take notice of the inſtant of the ſun's diſappearance, and then immediately to aſcend into the main-top, or to the top-maſt croſs-trees, from whence a very conſiderable part of his diſc will ſtill remain viſible, and will not diſappear till ſeveral ſeconds after the apparent ſetting from the deck. If obſervations of this nature be made with the teleſcope, the effect is ſtill more remarkable; ſhips appearing from the deck with their top-gallant maſts only above the water; at leſs diſtances, their top-maſts are ſeen; and as the diſtance continually either increaſes or decreaſes, the ſhip in ſight will appear to become more and more immerſed, or to riſe gradually out of the water. It cannot therefore be doubted, but that the ſea is of a convex form, and as theſe appearances are every where alike, it muſt be every where alike convex. Now a body which is every where alike convex, is ſpherical; and it has already been ſhewn that the land is of the ſame figure as the ſea. Conſequently the land and ſea together form a ſpherical ſurface.

THEOREM

THEOREM I.

The earth being ſpherical, the diſtance between the ſummit of any eminence and the fartheſt viſible point of the ſurface of the globe, is a geometrical mean proportional between the perpendicular height of the eminence, and the diameter of the earth added to that height. Fig. 54.

Demonſtration. Let the circle EKD repreſent a ſection of the earth, by a plane paſſing thro' its center, AB a perpendicular eminence, and AD a tangent to the curve ſurface of the earth, drawn from A to the point of contact D, which will be the moſt remote point of the ſurface viſible in that direction from A.

Continue AB thro' the center C, to the oppoſite ſurface of the earth E. Join BD, CD, and ED, and from C let fall the perpendicular CG upon BD. Then AB:AD::AD:AE.

For the triangle DCB is an iſoſceles triangle, becauſe of the equal radii CB, CD, and the right angled triangles CGB, CGD, are equiangular; (theo. 5. corol. 1.) the angles GCD, GCB, being equal. Therefore the angle GCB is half the angle DCB.

Now the angle DCB is equal to the angles DEC, CDE, taken together; (theo. 6.) and theſe two laſt angles are equal each to each, becauſe they are oppoſite the equal ſides CD, CE; (corol. 2. theo. 7.) whence the angle DEC is equal to the half of DCB, that is to ſay, the angle GCB.

In the triangles EDB, CGB, the angles DEB, GCB, are equal, and the angle at B is common to both, therefore the remaining angles EDB, CGB, are equal. And CGB being a right angle, EDB is alſo a right angle.

The angle CDA is likewiſe a right angle. (Theo. 12.)

If from the right angles EDB, CDA, be taken the common angle CDB, the remaining angles CDE, BDA, will be equal. Axiom 2. But the angle CDE was ſhewn to be equal to the angle DEC.

Therefore in the triangles ADE, ABD, the angles BDA, DEA, are equal, and the angle at A is common to both. Whence the triangles are equiangular. (Theo. 5. corol. 1.)

Conſequently AB : AD::AD : AE. (Theo. 9.)

Which was to be proved.

This theorem is applicable to finding the diameter of the earth, when the height AB and diſtance AD are known; becauſe if AB be taken from AE the fourth term, the remainder will be BE, or the diameter ſought. But as theſe known lines are always extremely ſmall, when compared with the diameter of the earth, a minute error in either of them will produce a very great uncertainty in the fourth term. For this reaſon it cannot practically be applied to this purpoſe. But it is uſeful to find either of the terms AB or AD, when one of them only is given, and the diameter of the earth known. For AE : AD :: AD : AB, where BE may be taken for AE, and the ratio will be very nearly the ſame, on account of the great length of BE; and the ſquare root of $\overline{AB \times AE}$ in numbers, is equal to AD. (Theo. 3. corol. 2. ſect. 1.) It is alſo uſeful to find the dip or depreſſion of the viſible horizon or edge of the ſea below the level of an obſerver whoſe eye is elevated above the ſurface. For an obſerver at A will behold the edge of the ſea at D below the level AH, the angle DAH being the dip.

Now the angle DAH is the complement of the angle DAC, becauſe the angle HAC is a right angle; and in the right-angled triangle ADC, the angle DCB is likewiſe the complement to the angle DAC. The angle DCB therefore is equal to the dip, and is meaſured by the arc BD, which in no practical caſe will differ ſo much as $\frac{4}{100000}$ of the whole from AD. Conſequently AD may be taken in practice for the arc DB; that is, the length of AD in geographical miles will meaſure the angle DCB, or the dip.

An example will make this familiar.

Example. It is required to find the dip of the viſible horizon beneath the level of an obſerver's eye, which is elevated thirty feet above the ſurface of the ſea.

The diameter* of the earth is 41,828,814 feet, to which add 30 feet, and the ſum is 41,828,844, which multiplied by 30 produces 1,254,865,320, the ſquare root of which number is 35,424 feet, or 5.815 geographical miles of 60 to a degree of a great circle on the earth. This operation may be accurately and readily done by logarithms.

Here it is found that AD on the diſtance of the fartheſt viſible part of the ſea is 5.8 geographical miles, or 35424 feet, which may be taken for the arc DB. The dip is therefore nearly ſix minutes of a degree. And if AB be ſuppoſed to repreſent the height of a ſhip's poop, it would juſt begin to ap-

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* This meaſure of the diameter of the earth is the mean reſult of the ſeveral admeaſurements made by the French mathematicians.—Hence a mean degree is 365,528 feet, and contains nearly 69¼ Engliſh miles: This ſubject is treated more at large in Book VIII. Sect. VIII. of Robertſon's Elements of Navigation; where it is to be noted, that in Art. 130, the word *axis* is by an overſight ſeveral times uſed inſtead of *ſemi-axis*.

pear above the water to an eye at D. This theorem has been propoſed for determining the diſtance of a veſſel or lighthouſe, whoſe height is known, and which appears juſt emerging from the ſea. But there are difficulties attending on this ſort of obſervation, which makes it little, if at all preferable to eſtimation or gueſs from other circumſtances.

The convex figure of the earth is likewiſe proved from the many voyages which have been made about it. For by continually ſailing to the Weſtward, ſhips arrive at length at the port from whence they took their firſt departure. But this could not happen if the earth were not of a figure which is acceſſible on all ſides.

Obſervations on the celeſtial appearances ſtill farther confirm this truth. The ſhadow of a body is a projection or delineation of its appearance, when viewed from the place from whence the light is emitted. The earth being ſhone upon by the ſun, muſt caſt a ſhadow towards the contrary part or region of ſpace; and this ſhadow, if received upon another body, would delineate its appearance as ſeen from the ſun. When the moon is in that part of the heavens which is nearly oppoſite, with reſpect to the earth, to the place of the ſun, the ſhadow of the earth falls on the moon, and cauſes that obſcuration which is called an Eclipſe. Now in every eclipſe of the moon, the ſhadow of the earth is circular: the earth therefore appears circular, when viewed from the ſun in any poſition whatever: but a body which appears circular from every point of view, is that which geometers call a globe or ſphere. The earth is therefore a globe or ſphere.

The juſt-mentioned obſervations prove beyond controverſy the ſpherical figure of the earth. But the moſt accurate and deciſive proofs are derived from the compariſon of the meaſures of diſtances upon the ſurface of the earth, with the change of poſition which the heavenly bodies apparently obtain when viewed from places at ſome diſtance from each other. For example, ſuppoſe an eclipſe of the moon to happen at midnight at London, the moon would, at the ſame inſtant of time, be ſeen near ſetting by the inhabitants of Bengal, and riſing by the inhabitants of Florida, and many other parts of America. This is an obvious and familiar inſtance, but the like appearances with reſpect to poſition, are obſervable in all the other heavenly bodies. And it is found univerſally, that the changes in the angle formed between the perpendicular or plumb line, and a line drawn to the celeſtial object, are ſuch as could not take place, if the earth were of any other figure than ſpherical.

THEOREM II.

In the ſame plane, if the angle formed between any two right lines drawn perpendicular to a given line, be directly proportional to the part of the line contained between them, the line itſelf will be circular. Fig. 55.

Demonſtration. In the line LM let there be aſſumed any number of points K, I, H, G, F, equidiſtant and indefinitely near each other, thro' which let the perpendiculars AK, BI, CH, DG, EF, be drawn, and prolonged on one ſide, till they reſpectively croſs each other.

Then, by the hypotheſis, the angles KCI, ICH, HCG, GCF, will be equal each to the other. And becauſe of the indefinitely ſmall diſtance between the points K, I, H, G, F, the lines KI, IH, HG, GF, may be conſidered as right lines. In the right lined triangle KIC, the angles at K and I are equal by the hypotheſis; KC and IC are therefore equal. (Corol. 2. theo. 7.) And in the right lined triangles IHC, KIC, the angle HIC is equal to the angle KIC; the angle ICH to the angle KCI; and the baſe IH to the baſe IK. The triangles IHC and KIC are therefore congruous; (conſect. 1. to prob. 7.) and have one common vertex at C. In like manner it may be proved, that the triangles HGC, GFC, are congruous with the triangle KIC, and meet in the ſame common vertex C. Now ſince the number of the indefinitely ſmall parts taken in LM is unlimited, they may be aſſumed ſo numerous, as to occupy the whole of the line LM, the perpendiculars drawn thro' their extremities all meeting at point C, equally diſtant from every point aſſumed in LM. And by reaſon of the indefinite ſmallneſs of the interval between any two points, there will not be any aſſignable part of LM, to which a right line can be drawn from C, either greater or leſs than KC. LM is conſequently a line having ſuch a relation to the point C, as that all right lines drawn from any point thereon to the point C, ſhall be equal. That is to ſay, it is either part or the whole of a circle, whoſe center is C. (Def. 14.) Which was to be proved.

This theorem is applicable to the earth. For the celeſtial phenomena happen in various parts of the viſible hemiſphere, according to the ſituation of the obſerver on the ſurface of the earth, and from thence the relative poſition of the perpendicular or plumb line is eaſily obtained. By means of obſervations of this nature it is found, that every plane ſection of the earth is a circle, and conſequently that the earth is a ſphere.

Let AEK, fig. 56, repreſent a circle deſcribed ſo as to divide the earth into two equal parts. Let an obſerver at A behold a ſtar in the direction AD in the plane of the circle, the line AD making the angle DAB with the perpendicular BA. Another obſerver at E in the ſame circle, will behold the ſame ſtar in the direction of the line EG, which, by reaſon of the very great diſtance of the ſtar, will not ſenſibly differ from being parallel to AD. Continue the perpendiculars BA and FE, till they meet at C, forming the angle ECA; and draw CH parallel to AD (and by conſequence alſo to EG). Then becauſe of theſe parallel lines, (theo. 3.) the angle GEF will be equal to to the angle HCE, and the angle DAB to the angle HCA. But the angle ECA, or the inclination of the perpendiculars to each other, is equal to the difference between the angles HCA, ECH, or their equals DAB, GEF, when the lines GE, DA, fall towards the ſame region; or it is equal to their ſum when the lines GE and DA fall towards contrary regions.

The angle ECA being thus diſcovered, and the diſtance AE found by admeaſurement, the circumference of the earth may be eaſily known by analogy. That is to ſay, as the number of degrees contained in the arc which meaſures the angle ECA is to the whole circle, or 360°, ſo is the length of the arc AE as found by admeaſurement in known parts, to the whole circumference of the earth in the ſame known parts.

CHAP. II.

OF THE MOTIONS OF THE EARTH AND OTHER PLANETS. DEFINITIONS OF THE IMAGINARY LINES OF THE SPHERE, AND THEIR AFFECTIONS.

SINCE terms, or words which conciſely expreſs notions, that otherwiſe we ſhould be under the neceſſity of continually defining, are neceſſarily required for the diffuſion of knowledge as it becomes more extenſive, Geographers and Aſtronomers have made uſe of a conſiderable number, and have even invented a variety of circles, which being ſuppoſed to be applied to the ſpherical ſurface of the earth, or to the apparent ſpherical concavity of the heavens, are found very uſeful in facilitating the communication of ſcience.

It is apparent to every one, that the celeſtial bodies are conſtantly changing their ſituations in the heavens. The ſun, the moon, and every other luminary, appear reſpectively to deſcribe circles which are completed in about the time of a natural day; by which moſt of theſe bodies are ſeen to riſe and ſet. This diurnal apparent motion is cauſed by a real motion of the earth upon its axis, in the contrary direction. The intended limits of this book prevents our enlarging on the proofs of this motion of the earth. There are many reaſons by which it is rendered probable; but the ſtrongeſt phyſical proof is obtained, from the admeaſurement by which the figure and magnitude of the earth is obtained. For tho' we have hitherto aſſerted that the earth is ſpherical, in order to ſimplify our arguments, and to avoid a premature diſcuſſion of this buſineſs of its rotation; yet it is found from accurate obſervations, that the earth differs in a ſmall degree from a ſphere, and is in reality an oblate ſpheriod, being flattened about the two oppoſite points of that axis, which coincides with the axis of the apparent rotation of the heavens; or more properly, that it is ſwelled out at the parts fartheſt diſtant from thoſe points. It is not neceſſary to explain the laws of motion, to convince even the moſt vulgar obſerver, that bodies which are whirled about a center, do by that motion acquire a tendency to fly off. A mop, which when hung up at reſt is nearly ſpherical, ſwells out and becomes flattened when it is whirled; and the thumbs would fly off if they were not retained by the adheſion of their parts. So likewiſe do the parts of the earth, fartheſt from the axis of its motion, ſwell out and recede from the axis, tho' their gravity prevents their flying off. And if we imagine the mop to be in the axis of an empty tub which does not touch it, it is evident that no rotation of the tub on its axis, will ever cauſe the figure of the mop to change; an abſolute motion of the mop itſelf being neceſſary for that purpoſe. So likewiſe in order to change the figure of the earth, it is neceſſary that the earth itſelf ſhould abſolutely revolve, and not the heavens. And that the heavens themſelves do not revolve diurnally is evident, becauſe we obſerve no ſigns of that exceeding ſtrong tendency to recede from the axis of rotation, which a motion ſo prodigiouſly ſwift muſt infallibly produce.

This illuſtration may give the uninſtructed reader a notion of this argument, which is not a ſuppoſition built on the aptitude of compariſon, but accurately agrees with the true theory of motion, combined with the effects of gravity, as it is really found to act. We therefore proceed to ſpeak of the earth, as revolving on its axis in about 24 hours.

A great circle is that which divides a ſphere into two equal parts.

That point of the heavens which is perpendicularly over the head of any obſerver, is called the *zenith* of the place at which he is. The point of the heavens diametrically oppoſite the zenith, is called the *nadir*.

A great circle, which is 90° diſtant from the zenith, and conſequently divides the upper from the lower hemiſphere, is called the *horizon*. If the plane of the horizon paſs thro' the eye of the obſerver, it is called the *ſenſible horizon* of the place where it is; but if it paſs thro' the center of the earth, it is called the *rational horizon*. To this laſt all obſervations are referred. Navigators frequently term the bounding line or circular edge of the ſea, the *apparent horizon*.

Leſſer circles parallel to the horizon, are called *parallels of altitude*, if above, but *of depreſſion*, if below the horizon. Great circles paſſing thro' the zenith, are termed *azimuths*. Upon theſe the altitudes or angular heights of objects are meaſured.

The extremities of the axis on which the earth revolves, are called *poles*; and the two points in the heavens vertically above theſe, and which ſeem to be ſtationary, are called the *celeſtial poles*. The poles are diſtinguiſhed by the names *north* and *ſouth*.

A great circle on the earth, which is 90° diſtant from each pole, is termed the *equator*. Leſſer circles, parallel to the equator, are termed *parallels of latitude*. Great circles paſſing thro' the poles are termed *meridians*. But the meridian of any place is generally underſtood to be a ſemicircle drawn between the two poles, and thro' the given place.

A great circle in the heavens, which is in the ſame plane with the equator on the earth, and conſequently is 90° diſtant from each celeſtial pole, is termed the *celeſtial equator*. Leſſer circles in the heavens, parallel to the equator, are termed *parallels of declination*. Great circles paſſing thro' the celeſtial poles, are termed *hour circles*, or circles of *right aſcenſion*.

Latitude on the earth is the diſtance of any place from the equator, meaſured on the meridian of the place. Longitude on the earth is the ſhorteſt diſtance between the meridian of any place, and the meridian of any other place conſidered as the firſt or principal meridian: it is meaſured on the equator.

That part of the horizon at which the ſun and ſtars appear to riſe, is called the *Eaſt*; and that part at which they appear to ſet, is called the *Weſt*. If an obſerver ſtand with his right hand to the Eaſt, the Weſt will be on his left, the North before him, and the South behind him. Or more accurately, the meridian of any place is a North and South line, which divides the horizon into two equal parts; and a diameter of the horizon at right angles to the meridian, (which does not ſenſibly differ from the parallel of latitude of the place) is an eaſt and weſt line; the eaſtern extremity of which is that near which the riſing of the celeſtial bodies is performed, the oppoſite extremity is the Weſt, the North is to the left hand of the Eaſt, and the ſouth diametrically oppoſite to the North. Each of the four quadrants into which the horizon is thus divided, is ſubdivided into degrees and minutes, the quantity of which is reckoned from the North or South points. For naval uſe theſe quadrants are divided each into eight parts, called *points of the compaſs*, which are again ſubdivided into quarters. Of theſe we ſhall hereafter ſpeak more at large.

The ſtars are obſerved to be of two kinds, namely fixed ſtars and planets. The fixed ſtars are ſo denominated becauſe they all very nearly, if not abſolutely, preſerve at all times the ſame ſituation with reſpect to each other. From this circumſtance they are uſeful as ſo many land-marks, if the word may be uſed, by which the ſituations of other celeſtial bodies may be aſcertained, and the varieties obſerved to which they may be ſubject. By this kind of obſervation, as well as from the change of time at which they riſe or ſet, or come to the meridian of the place of obſervation, together with the mutations of the azimuths and altitudes, it is found that the ſun, the moon, and five ſtars called planets, or wanderers, are continually varying their place in the heavens. The planets are known by the names Saturn, Jupiter, Mars, Venus, and Mercury.

In the ſpace of 365 days 6 hours nearly, the ſun apparently paſſes in a direction contrary to that of the diurnal apparent motion, that is to ſay, from Weſt to Eaſt, through a great circle of the heavens, which is inclined to the equator in an angle of 23° 28′. This great circle is called the *Ecliptic*. The ſun, therefore, in its annual courſe, muſt twice decline to the diſtance of 23° 28′ from the equator, being half the year to the North, and half to the South. When the ſun is to the Northward of the equator, its light falls more perpendicularly on every place ſituated in North Latitude, at the ſame time that it illuminates more than half of the Northern hemiſphere. Every place in North latitude, therefore, at this time, is not only more heated by the direct falling of the light, but likewiſe has the ſun a longer time above the horizon; becauſe more than half of the Northern hemiſphere being enlightened at once, more than half of every parallel of latitude muſt be enlightened at the ſame time, and conſequently a place ſituated on any Northern parallel will, in the diurnal rotation of the earth, be a longer time in paſſing through the enlightened part of its parallel, than the dark part. That is to ſay, when the ſun is to the North of the equator, every place in North latitude will have warm weather, and the days longer than the nights; while, for the contrary reaſon, colder weather, and nights longer than the days, will obtain in the Southern hemiſphere. And during the other half year, in which the ſun has South declination, theſe events will happen quite contrary; cold weather and ſhort days prevailing in the Northern hemiſphere, while the ſouthern enjoys warm weather and long days.

This variety of the ſeaſons takes place gradually, becauſe the ſun's declination changes gradually. When the ſun is at the equator, the half of each hemiſphere is enlightened at once, the days and nights are conſequently equal over all the earth; and for this reaſon the two points at which the ecliptic interſects the equator, are called the equinoctial points, or *equinoxes*. When the ſun is near its greateſt declination, the change of declination is inconſiderable for ſeveral days; for this reaſon, thoſe two points of the ecliptic which are 90° diſtant from the equinoctial points, and at which the ſun has the greateſt declination, are termed the ſolſtitial points or *Solſtices*. The equinoxes are termed the vernal and autumnal equinoxes; and the ſolſtices are termed the eſtival and hyemal, or ſummer and winter ſolſtices.

Great circles drawn at right angles to the ecliptic, and conſequently interſecting each other in its poles, or 90 degrees diſtant from it, are termed *celeſtial meridians*. Latitude in the heavens is the diſtance of any object from the ecliptic, and is meaſured on the meridian of the object. Longitude is the diſtance between a given meridian, and that meridian which paſſes thro' the vernal equinox, or firſt point of aries. It is meaſured on the ecliptic in the order of the ſigns, from the ſaid point of aries, and is not therefore the ſhorteſt diſtance, except when the longitude does not exceed 180°.

Right aſcenſion is the diſtance between a given hour circle, and that hour circle which paſſes thro' the firſt point of aries. It is meaſured on the equator, in the order of the ſigns from the ſaid firſt point of aries, and is not therefore the ſhorteſt diſtance, except when the right aſcenſion does not exceed 12 hours, or 180°. Declination is the diſtance between a given object and the equator, and is meaſured on the hour circle which paſſes thro' the object.

For the more eaſy deſcribing and finding any fixed ſtar, they have long been claſſed into conſtellations, or collections of ſtars, which by their ſituation may be contained within the outlines of ſome animal or other object, which is imagined to be deſcribed in that part of the heavens they reſpectively occupy. The ecliptic paſſes thro' twelve of theſe conſtellations or ſigns, which form a broad band or imaginary circle called the *zodiac*; and the ecliptic itſelf is divided into twelve equal parts or ſigns, of 30 degrees, beginning from the vernal equinox, and proceeding forward according to the courſe of the ſun. Every diviſion of 30 degrees is denominated after the name of the conſtellation which occupied that ſpace, about the time of their firſt invention. For it is to be obſerved, that the axis of the earth does not abſolutely preſerve the ſame ſituation with reſpect to the fixed ſtars; but from cauſes we cannot explain in this work, is removed a minute quantity in the courſe of the year, by which means the equinoctial points are not fixed, but move backwards, or contrary to the annual courſe of the ſun. Whence it happens, that the natural year or period of the ſeaſons, is finiſhed about twenty minutes before the ſun has apparently deſcribed a complete circle. The names of the ſigns of the zodiac, and the months into which the ſun enters into them, are

Aries,	Taurus,	Gemini,	Cancer,	Leo,	Virgo.
March,	April,	May,	June,	July,	Aug.
Libra,	Scorpio,	Sagittarius,	Capricornus,	Aquarius,	Piſces.
Sept.	Oct.	Novem.	Decem.	Jan.	Feb.

The ſix firſt are northern, and the other ſix ſouthern conſtellations. When the ſun is juſt entering into Cancer, he is at his greateſt North declination, and begins to return back towards the equator. The parallel of 23° 28′ North declination, is therefore called the *Tropic of Cancer*, as is likewiſe its correſpondent parallel of latitude on the earth. For ſimilar reaſons the parallel of 23° 28′ South declination, is called the *Tropic of Capricorn*, as is likewiſe its correſpondent parallel of latitude on the earth.

The moon revolves about the earth in the ſpace of about twenty-ſeven days and ſeven hours, in the ſame direction as the ſun, and in an orbit which is inclined about 5 degrees to the ecliptic. The moon ſhines only by the light of the ſun which falls upon it: the dark ſide is conſequently inviſible to us, and according to the ſituation of the moon at different times, we ſee more or leſs of the enlightened part. Whence ariſes the variety of figure ſhe apparently takes. But the courſe of the lunations or changes of the moon's phaſes, is performed in about two days and a quarter more than is required for deſcribing her period, or entire orbit. For while the moon is paſſing thro' the twelve ſigns of the zodiac, the ſun is advanced almoſt one ſign, and it requires two days and a quarter for the moon to overtake him. The revolution of twenty-ſeven days and ſeven hours, is termed the *periodical revolution*; and that of about thirty days, is termed the *ſynodical revolution*.

The planets move nearly in the plane of the ecliptic. Their apparent motions reſpect the ſun, and from thoſe motions it is proved, that they revolve in orbits nearly circular in the center of which the ſun is placed. The five planets, *Saturn*, *Jupiter*, *Mars*, *Venus* and *Mercury*, revolve in orbits included within each other, in the order we have here mentioned their names. Mercury being neareſt the ſun.

It is known by the moſt abſolute geometrical proofs, that the ſun is more than one million times the bulk of the earth; Jupiter and Saturn are many hundred times the ſame bulk, and Mars and Venus are nearly of the ſame magnitude as the earth. Now ſince theſe vaſt bodies move round the ſun, their abſolute motions muſt be very complicated and intricate, if the apparent motion of the ſun in the ecliptic be cauſed by a real revolution of the ſun; but if the earth be admitted among the number of the planets, a beautiful order and regularity will prevail throughout the whole planetary ſyſtem; and that immenſe body which gives light and heat to the attendant planets, will be the center of the earth's orbit, as well as of the orbits of the other revolving bodies. That this is really the caſe, is proved as well from the Theory of Gravity as from the Motion of Light. For the light of the ſtars is ſubject to an apparent change in its direction, which is called the *Aberration of Light*, and ſtrictly correſponds to the reſult of theorems, founded on the conſideration of the velocity of light already known from other obſervations, together with the velocity of the earth in its orbit.

They who are not accuſtomed to reflection, will find a difficulty in reconciling theſe motions of the earth to the idea they have acquired, of conſidering it as abſolutely permanent and immoveable. But this difficulty will be removed by reflecting, that all bodies are equally indifferent to motion and to reſt. A body at reſt will not acquire motion, neither will a body in motion ſtop without a cauſe. For theſe reaſons the earth and the things upon it retain their motion; which being the ſame to ſenſe, both in velocity and direction in every part, the parts among themſelves are in the ſame ſituation as if they were at reſt. And there are not wanting a great number of inſtances to illuſtrate this. Seafaring people are never without them.

Thoſe who are buſied in the hold of a ſhip at an anchor, cannot by any perception determine whether the ſhip has ſwung round or no, by the turn of tide. When a ſhip firſt gets under way with a light breeze, ſhe may be going at a good rate before thoſe who are between decks can perceive it. And let the ſhip ſail ever ſo ſwiftly, it is found in every reſpect, as eaſy to jump towards the head as the ſtern; and all experiments relative to motion, may be performed exactly in the ſame manner as if ſhe were at an anchor, except ſo far as the irregular pitching and rolling of the veſſel may affect them, which it will do as much in one direction as another. It is needleſs to multiply inſtances; we ſhall therefore only remark in addition, that every one who has been in a boat muſt have obſerved, if he ſtood up juſt before the boat ſtruck the ſhore, that tho' there was no difficulty in ſtanding while the boat continued to move, yet the inſtant it ſtopped there was danger of his falling forward on his face. The reaſon is obvious. The paſſenger and the boat being both moved with equal ſwiftneſs, were at reſt with reſpect to each other, but as ſoon as the boat ceaſed to move, the motion of the paſſenger became perceptible, he being moved forward, becauſe there was not a cauſe ſufficient to ſtop him. So likewiſe it muſt be with every thing on the earth. While the earth and its creatures are carried in the ſame direction, and with the ſame velocity, every thing muſt happen as if it were at reſt. As the people in the cabbin of a ſhip, who carried along by a ſmooth current, can only perceive they move by looking out of the windows at objects which are at reſt; ſo we who are carried by the regular and unceaſing motion of the earth, can only perceive we move by looking at the ſun and ſtars, which reaſon aſſures us are ſtationary.

CHAP. III.

OF THE CAUSES OF THE CELESTIAL MOTIONS, AND OF THE TIDES.

IT is ſhewn by Sir Iſaac Newton, in his Mathematical Principles of Natural Philoſophy, that the planets are retained in their orbits by a power of the ſame nature, or rather by the ſame power as that which cauſes bodies to fall towards the earth. This power is termed gravity, and it will not be difficult to give an idea, by illuſtration, of the manner in which it acts in the preſent inſtance. It is evident from every experiment, that motion is always performed in right lines, except when ſome external force cauſes the moving body to change its courſe; and this change of motion is always in proportion to the force by which it is cauſed. For example, if a cannon ball be let fall, it will, merely by its gravity, paſs thro' a ſpace of about 16 feet in a ſecond; and if it be thrown horizontally with any velocity whatſoever, it will deviate from the level or right-lined courſe exactly the ſame quantity towards the center of the earth in a ſecond. Suppoſe the action of gravity to be ſuſpended, and it is evident that the ball projected in an horizontal right line, would proceed for ever in a tangent to the earth, with an uniform velocity, becauſe there would be no cauſe by which either its direction or velocity would be changed. And by computation it is eaſily ſhewn, that after paſſing through a ſpace of 25,870 feet, it would be 16 feet more remote from the center of the earth than at firſt. But again, ſuppoſe gravity to act, and the ball to be projected horizontally with a velocity of 25,870 feet in a ſecond, this projectile force will carry it from the center 16 feet in the ſame time that gravity carries it the ſame quantity towards the center. That is to ſay, at the end of the ſecond the ball will be found at the ſame diſtance from the center as at firſt, becauſe theſe contrary forces prevent each other's operation. The ſame may be ſhewn likewiſe for the next ſecond, and ſo on, 'till the ball having paſſed round the earth, ſhall have deſcribed a complete circle, which it will continue to do for ever. And becauſe 25,870 feet is contained 5077 times in the circumference of the earth, the revolution will be completed in 5077 ſeconds, or 1 h. 24 m. 37 ſ.

It is ſcarcely neceſſary to obſerve, that this velocity is far beyond any that can be given to bodies by human art.

The motions of the heavenly bodies are found to anſwer the moſt rigid computations founded on the principle of gravity. This power is found to decreaſe at greater diſtances from the attracting body, in the inverſe proportion of the ſquare of the diſtance. That is to ſay, the gravitating force at any diſtance from a given body, is to the gravitating force at any other diſtance, as the ſquare of the laſt diſtance is to the ſquare of the firſt.

A body attracted by the earth, or any other body, &c. does itſelf attract the earth, &c. with an equal force in the contrary direction. For if the earth were not attracted by a mountain with a force equal to that which it exerts on the mountain itſelf, the preſſure by which they adhere together would be greater in one direction than another, and conſequently the whole maſs would move towards that part. But no ſuch motion is ever generated. From this re-action it is impoſſible for one body to revolve round another, while the latter remains at reſt. Theſe revolutions are always performed about a point in the line which joins the centers of the two bodies; which point is called the center of gravity.

The force of gravity exerted by one body on another, may be ſaid to be equal on all its parts, when the magnitude or diameter of the latter body does not bear any ſenſible proportion to its diſtance; but when the contrary is the caſe, the nearer parts will be attracted perceptibly more ſtrongly than thoſe which are more remote. This takes place in the earth, and is the cauſe of the tides. For the moon revolves about the earth, as has before been obſerved, or to ſpeak more ſtrictly, about the center of gravity of the moon and earth, while the earth deſcribes a ſimilar orbit about the ſame center. Now if the inſtance of the cannon ball be remembered, it will be eaſily underſtood, that where gravity acts leſs powerfully, a leſs projectile velocity will be required to keep the revolving body from approaching the center; and contrarywiſe, a greater velocity will be required, where gravity is ſtronger. The earth revolves about the moon with a projectile force which is adjuſted nearly to the action of the moon's attraction on the parts near the earth's center. Conſequently the parts on the ſide neareſt the moon, where the attraction is more powerful, have not a ſufficient velocity to prevent their approaching towards the moon, if the earth's ſtronger attraction did not retain them; and the parts on the ſide fartheſt from the moon, where gravity is leſs ſtrong, are moved too ſwiftly, and would recede towards the direction of the tangent, if they were not likewiſe retained by the earth's attraction. But though the earth's attraction is ſufficient to retain theſe parts, yet it does not retain them ſo ſtrongly as it would if this action of the moon did not exiſt. The unequal attraction of the moon, therefore, renders thoſe bodies leſs heavy which are neareſt to, and alſo thoſe which are moſt remote from the moon.

Beſides this effect which is produced by the inequality of the action of gravity at different diſtances, there is another which ariſes from the direction in which it is exerted. For the direction of the projectile motion of the earth being in the tangent to the orbit deſcribed by its center, the parts remote from the center, which are ſituated in the ſame orbit, will not be moved in the direction of tangents to the parts of the orbit they poſſeſs; for the preceding parts will move in a direction without the tangent, while the ſucceeding parts will move in a direca direction within the tangent. On this account the moon's attraction will be exerted more directly againſt the motion of the preceding parts, than of the central parts; whence the motion of the preceding parts will be leſs than of thoſe at the center, and conſequently the force by which they tend to the center will be augmented, that is, they will be heavier. And on the contrary, the moon's attraction will add to the motion of the ſucceeding parts, and increaſe their weight likewiſe in the ſame manner. On both accounts therefore, the parts of the earth immediately beneath the moon, or thereabouts; and alſo the oppoſite parts of the earth will have their weight diminiſhed, while thoſe which are about 90° diſtant from the place immediately beneath the moon, will have their weight increaſed.

If the earth were intirely ſolid, theſe ſmall variations in the weight of its parts, would be abſolutely inſenſible to common obſervation; but if the earth were fluid, or every where covered with a deep ſea, the waters by their weight would not ſubſide to equal diſtances from the center, and form a globe; but being lighter beneath, and oppoſite to the moon, they would there be higher, and at the intermediate parts they would ſubſide, on account of their greater gravity. So that in this caſe, the earth would aſſume the figure of an oblong ſpheroid, whoſe axis if continued would paſs thro' the center of the moon.

Thus far we have not attended to the rotation of the earth on its axis. Let the moon be ſuppoſed immediately over the equator, and the earth to revolve on its axis. The protuberant parts would then be carried to the eaſtward, and would ſubſide as their gravity increaſed by their change of ſituation; and the depreſſed parts would riſe for the contrary reaſon. But as this ſubſidence and elevation cannot be ſuddenly effected when their cauſes are ſmall, and as the action of the moon extends to a diſtance on each of the points at which it is moſt powerful, the greateſt ſubſidence will not happen at the 90th degree from the line paſſing thro' the center of the moon and earth, but at a diſtance to the eaſtward of it; and the greateſt elevation will not be at the points immediately beneath or oppoſite the moon, but at a like diſtance to the eaſtward. By this means in the courſe of the diurnal rotation, or more properly in the courſe of a lunar day, every place on the earth would have twice high water, and twice low water. High water happening at a certain time after the moon's coming to the meridian of the place, either above or beneath the horizon, and low water at the middle time, between the two terms of high water.

But the earth is only in part covered with water, and therefore theſe effects take place only according to circumſtances. In extenſive oceans it is high water three hours after the moon has paſſed the meridian, and later in narrow ſeas and rivers which have a free communication with the main ocean. But inland ſeas which have either an imperfect communication or none at all with the ocean, have no tides, becauſe their extreme parts are not ſufficiently remote from each other, to be ſenſibly affected either by the difference in quantity or direction of the moon's gravity.

The differences of the ſun's action on the parts of the earth, produces an effect ſimilar to that of the moon; but becauſe the ſun is vaſtly more diſtant than the moon from the earth, the diameter of the earth bears a much leſs proportion to this diſtance, and the effects are much leſs. When the ſun, moon, and earth, are nearly in the ſame line, that is, at the time of new and full moon, the action of the ſun raiſes the water at the ſame places as the action of the moon does, and the tides being then higheſt are called *ſpring tides*. But when the ſun and moon are 90° apart, that is, at the firſt and fourth quarters beginning, the ſun raiſes the water where the moon depreſſes it, and therefore the tides riſe by the exceſs of the action of the moon, above that of the ſun. The tides being then leaſt are called *neap tides*. At intermediate ages of the moon, the tides are affected by the combination of the two forces: but becauſe that difference of attraction which cauſes the tide is always ſtrongeſt in the moon, the time of tide is always regulated by the moon's coming to the meridian.

The afflux which cauſes high water in the ocean, is longer in paſſing thro' narrow ſeas and rivers, as has been remarked; but as the obſtacles by which the tide is retarded are always the ſame, winds excepted, at any given place, ſo the difference between the time of tide out at ſea, and at any place upon the coaſt of a river or narrow ſea, is always the ſame. It is therefore a rule, that if the time of high water at any place, on the day of the new or full moon, be added to the time of the moon's coming to the meridian, taken from an ephemeris or otherwiſe, the ſum will be the time of high water for that day. The laſt column in table 12, contains theſe numbers.

CHAP. IV.

OF THE WINDS.

A WIND is a body of air in motion, and takes its name from the point of the compaſs from whence it blows.

That motion of the air which conſtitutes wind, is in general if not always, cauſed by the alterations of temperature to which, from various cauſes, the atmoſphere is ſubject. For all bodies expand, that is to ſay, occupy more ſpace when heated, than when cool; and it is ſufficiently well known that of two fluids, the lighter will riſe to the higher place. Now if two portions of the air at the ſurface of the earth be in different temperatures, the hotteſt will, by reaſon of its expanſion, be ſpecifically the leaſt heavy, and will conſequently riſe, while the denſer air ruſhes in on all ſides to ſupply its place. This ruſhing in of the air is wind, and may be experimentally ſhewn by many methods; but it will be ſufficient for our purpoſe to direct the reader's attention to the aſcent of heated air, which aſcends together with the ſmoke from all culinary fires. By the help of this preliminary obſervation, we ſhall be enabled to hint at the cauſes of the ſeveral kinds of winds, after ſpeaking of them in order.

With reſpect to their direction, winds may be claſſed under three heads or claſſes, namely, general, periodical and variable.

General winds are thoſe which blow always nearly in the ſame direction. In the open ſeas, that is, in the Atlantic and Pacific oceans, under the equator, the wind is found to blow conſtantly from the Eaſtward; this wind prevails on both ſides of the equator, to the latitude of 28°. To the Northward of the equator, the wind is between the North and Eaſt, and the more Northerly, the nearer the northern limit. To the Southward of the equator, the wind is between the South and Eaſt, and the more Southerly, the nearer the ſouthern limit.

Between the parallels of 28 and 40 South latitude, in that tract which extends from 30° Weſt, to 100° Eaſt longitude from the meridian of London, the wind is variable; but by far the greater part between the N. W. and S. W. ſo that the outward bound Eaſt India ſhips generally run down their Eaſting on the parallel of 36° South.

Beyond the Northern limit of the general wind in the Atlantic ocean, the Weſterly winds prevail, but not with any certainty of continuance.

Near the Weſtern coaſt of Africa, within the limits of the general winds, the winds are found to be deflected towards the ſhore; inſomuch, that they are found to blow from the N. W. and S. W. quarters for the moſt part, inſtead of the N. E. and S. E. as is the caſe farther out at ſea.

The general winds are uſually called *trade winds.*

In the Atlantic ocean the S. E. trade wind extends as far as 3° N. and the N. E. trade wind ceaſes at the 5th degree N. In the intermediate ſpace are found calms, with rain, and irregular uncertain ſqualls, attended with thunder and lightning. But this ſpace is removed ſomewhat farther to the Northward or Southward, according as the ſun's declination is more Northerly or Southerly.

Periodical winds are thoſe which blow in a certain direction for a time, and at ſtated ſeaſons are found to change and blow for an equal ſpace of time, from the oppoſite point of the compaſs. Theſe may be divided into two claſſes, viz. Monſoons, or winds that change annually; and land and ſea breezes, or winds that change diurnally.

While the ſun is to the Northward of the equinoctial, that is to ſay, in the months of April, May, June, July, Auguſt, and September, the wind blows from the Southward over the whole extent of the Indian ocean; namely, between the parallels of 28° N. and S. latitude, and between the Eaſtern coaſt of Africa, and the meridian which paſſes thro' the Weſtern part of Japan. In the ſea between Madagaſcar and New Holland, the S. E. wind prevails as far as the equator, where it deflects and blows into the Arabian Gulf and Bay of Bengal, from the S. W. Between Madagaſcar and the main land of Africa, a S. S. W. wind obtains and coincides with the S. W. wind in the Arabian Gulf. To the Northward of New Holland the S. E. wind is predominant, but varies very much among the iſlands; and between the Peninſula of Malacca and the iſland of Japan, a S. S. W. wind prevails. All this is to be underſtood for the aforementioned months.

But in the other months, October, November, December, January, February, and March, a remarkable alteration takes place. In the ſea between Madagaſcar and New Holland, the S. E. wind extends no farther to the Northward, than about the 10th degree of South latitude; the other ten degrees being occupied by a wind from the oppoſite point of the compaſs, or N. W. at the ſame time that the winds in all the Northern part of the Indian ocean ſhift round, and blow directly contrary to the courſe they held in the former ſix months. Theſe winds are called *Monſoons*, or ſhifting Trade Winds.

Theſe changes are not ſuddenly made. Some days before and after the change, there are calms, variable winds, and dreadful ſtorms, attended with thunder, lightning and rain.

On the greater part of the coaſts of lands ſituated between the Tropics, the wind blows towards the ſhore in the day time, and towards the ſea in the night. Theſe periodical winds are termed the land and ſea breezes, and are much affected both in their duration and returns, by the courſes of rivers, tides, &c.

Variable winds are thoſe which are ſubjected to no period either in direction or return, and are too well known to need deſcription.

If the earth did not revolve on its axis, it is plain that the ſun being ſtationary over one particular ſpot, would rarify the air at that ſpot: it would conſequently aſcend by the preſſure of the circumambient and leſs rarified air, till it arrived at a region in which the air was ſufficiently rare to ſuffer it to expand on all ſides: and thus there would be produced a converging wind near the ſurface of the earth, and a contrary or divergent wind in the upper region of the air. But ſince the earth does revolve on its axis, and the ſun therefore is not ſtationary, it follows that the place at which the air is moſt rarefied, will be found ſucceſſively in every point of the parallel over which the ſun moves in the courſe of a day. And as this place continually moves to the Weſtward, the lower air muſt as conſtantly follow it. Hence we have the origin of the general N. E. and S. E. trade winds, which no doubt would extend over the whole of the ſpace between the tropics, were it not for the different temperatures of the continents and iſlands over which the ſun paſſes. For the ſurface of earth is more heated than that of the ſea, by reaſon that the tranſparency of the water permits many of the rays of light to paſs to its interior parts, before they are ſtifled and loſt. The air therefore which is contiguous to the land, will be more heated than that which reſts upon the ſea, and will prevent the regularity of the effect. Thus near the Weſtern coaſts of Africa and America, the winds blow from the Weſtward, to ſupply the conſtant rarefaction which thoſe heated lands produce.

The general N. E. and S. E. trade winds, producing in the upper region of the air winds in the contrary directions, ſeem to be the cauſe of the Weſterly winds which are obſerved to prevail between the latitudes of 28° and 40° South.

In accounting for the monſoons or periodical trade winds, it is neceſſary to mark the peculiar circumſtances which they obtain in the Indian ocean, and which are not found in the Atlantic or Pacific oceans. They ſeem to be theſe: that the ocean is bounded to the Northward by ſhores whoſe latitude does not exceed the limits of the general trade wind; and that the general trade wind falls on lee-ſhores to the Weſtward.

The ſun being twice in the year vertical in the equator, and never departing more than $23\frac{1}{2}°$ from thence, cauſes the air in that climate to be hotter than at any other place on the ocean; and is the occaſion of the trade wind, as has already been ſhewn. Such a rarefied ſpace muſt extend acroſs the Indian ocean, and produce a South-eaſt wind to the Southward, and a North-eaſt wind to the Northward of the equator, over which, in the upper regions of the air, the winds return in the contrary directions. This we accordingly ſee happens in the months of October, November, December, January, February, and March. But when the ſun declines to the Northward, and heats the lands there ſituated, the air contiguous to thoſe lands becomes rarefied, and the lower air has a tendency to move that way. This tendency increaſes as the ſun advances farther North, inſomuch, that the whole body of the lower air to the Northward of the equator, moves thither, notwithſtanding the equatorial rarefaction which muſt be ſupplied by the upper or returning current. So that the body of the lower air in the Northern part of the Indian ocean, is determined, as to its courſe, by the greater rarefaction: if the rarefaction at the ſurface of the land be greater than at the equator, the wind blows to the North, and the contrary happens when the equatorial rarefaction is greateſt. When the Northerly trade wind prevails, it blows out of the Arabian gulf, upon the coaſts of Arabia, Aynan, and Zanguebar, and is reflected into the Straits of Moſambique. And at the other ſeaſon, the general Southerly wind ſeems to be reflected to the Weſtward by the ſame cauſe.

Theſe, or ſome ſuch like, are probably the cauſes of the winds which prevail in the Indian ſeas. But the obſervations we are in poſſeſſion of, are too few and too inaccurate for the purpoſe of forming a theory. To which may be added, that all the atmoſpherical appearances ſeem to depend on ſo many, 'till of late unregarded cauſes, particularly the operation of electricity, that to inveſtigate them more minutely would require a ſeparate volume.

After what has been ſaid, it will not be difficult to account for the land and ſea breezes. For the land being heated in the day-time, the wind blows in ſhore to ſupply the place of the aſcendent rarefied air: and in the night the land cools and condenſes the air, occaſioning the land breeze.

The circumſtances on which the variable winds depend, are referable to thoſe already noticed, but act ſo differently in particular caſes, that we cannot pretend in this place to reduce them to any regular enumeration.

CHAP. V.

OF THE INSTRUMENTS USED TO MEASURE ANGLES.

IN travelling over the ſurface of the globe, the two particulars by the help of which we fix in our minds or communicate to others the idea we have of the ſituation of any place, are its diſtance from ſome other known place, and the direction in which that diſtance is meaſured. The diſtance is found by admeaſurement, or the ſucceſſive application of ſome known meaſure, as a foot, a yard, a pace, &c. by which it is diſcovered how many are contained in that diſtance; and the direction or bearing of the place under conſideration, from the other known place, is determined by meaſuring the angle formed between a line drawn in ſome ſettled direction, from the latter place, and another drawn between the two places. Thus, Fig. 57, the ſituation of the place A is determined with reſpect to B, when the diſtance BA is meaſured, and the bearing or angle formed between line BA and a line BC drawn in ſome ſettled direction from B, is likewiſe known; provided it be noted at the ſame time whether BA lies to the right or left of BC. Now the magnitude of the original meaſure by which BA is determined, as well as the poſition of BC, is arbitrary; but when each is ſettled by the conſent of mankind, they ceaſe to be equivocal, and become determinate and preciſe. In the dawn of ſcience, it is very probable that the poſition of the principal line BC, was determined by that of ſome remarkable object, as a mountain, a coaſt, or the like, and accordingly we find that the names of ſeveral winds, both in the ancient and modern languages, are taken from the places* from which they blow to ſome other place. But this confined method of marking the bearings, could not be long uſed even in the infancy of knowledge. The impoſſibility of drawing any line upon the earth which could be practically referred to for this purpoſe, made it neceſſary to have recourſe to the heavens, by which the Eaſt, Weſt, North, and South points of the horizon are determined, as has been already mentioned. Theſe points are called the *Four Cardinal Points.*

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* ——— creberque procellis
Africus:——— VIRG.

The *Mariner's Compaſs* is an inſtrument which is made uſe of for readily determining the ſituation of the cardinal points, and conſequently of the other ſubdiviſions of the horizon. Its principal part is a card or circle of ſtiff paper, which is divided by diameters drawn and ornamented as in Fig. 58. This card repreſents the horizon; the point marked with the *fleur de lis* is the North point, and its oppoſite is therefore the South; the point marked with a croſs is the Eaſt, and its oppoſite is therefore the Weſt; the intermediate ſeven points in each quadrant are named according to the letters which appear in the figure, in which the letters N. S. E. W. ſtand for the words North, South, Eaſt, Weſt. At the center of the card is a cap of metal, or of agate, hollowed conically underneath; and immediately beneath the N. and S. line is fixed a ſtrait bar of ſteel, rendered magnetical, which is uſually termed the Needle. This card is incloſed in a box, in the center of which is fixed an upright point of metal, upon which the card is poiſed horizontally on its cap, the whole being preſerved from the air by a pane of glaſs at top; and for ſea-ſervice, the box is flung in an apparatus, which enables it to continue nearly horizontal, notwithſtanding the agitation of the veſſel.

The conſtruction of this, as well as of any other inſtrument, may be much more readily apprehended by a view of the inſtrument itſelf, than from the moſt accurate deſcription; we ſhall therefore only remark, that the card being ſupported on a ſingle point, is kept in an horizontal ſituation by its weight which lies below the center of ſuſpenſion; and would therefore revolve horizontally, or reſt with its points in any ſituation, were it not for the magnetical bar or needle, which having a tendency to conform itſelf nearly to the meridian, detains the card in that poſition. So that its North point will always continue North, however the box itſelf be moved, provided the card be left at liberty.

Philoſophical writers may be conſulted for a full account of the property of magnetiſm, which is peculiar to iron; and though known from the earlieſt ages, is ſtill among the moſt wonderful and leaſt underſtood events in nature. There are few who have not had opportunities of ſeeing a ſewing needle taken up and ſuſpended by a magnetical bar of ſteel. If a ſmall paper boat be placed in a veſſel of water, and a ſewing needle put into it, it will as uſual reſt in any poſition; but if the needle be previouſly touched with a magnet, it will have acquired the property called magnetiſm, by means of which one of its ends will turn to the North, and the other to the South: and if the paper-boat be removed into any other poſition, the polarity of the needle will carry it round, ſo that the ſame ends of the needle may again point to the North and South as before. The uſe of the boat is to take away the greateſt part of that friction which in other circumſtances prevents the needle from turning, and any other method which would ſufficiently diminiſh that friction, would anſwer the ſame purpoſe.

There are many methods by which magnetiſm may be originally given to iron. If a bar of iron be fixed or lie long in an upright poſition, if it be placed in a North and South direction, and rubbed all one way with a blunt file; if in the ſame poſition it be hammered at one end, if it be heated and cooled in that poſition, or, in ſhort, if any thing be done which ſtrongly agitates its parts, while it lies in the direction of the meridian, it will acquire a degree of magnetiſm which may be afterwards increaſed in a number of magnets, by ſucceſſively touching them with each other, according to rules diſcovered by experience. In all theſe kinds of experiments there is a certain knack or habit, that is gained by practice, and is very neceſſary in order to ſucceed. The loadſtone is an ore of iron, which is magnetical, which property it probably acquires by lying long in the mine in one poſition.

Every magnet has two points nearly oppoſite, at which the attractive force is ſtrongeſt. In a ſtrait bar of iron or ſteel, theſe points are commonly at the ends. They are called *Poles.* That point which tends to the North, is called the North Pole; and the other the South. And in any two magnets, poles of different names attract each other; but poles of the ſame name repel. In touching a bar in order to give it the property of magnetiſm, that end of the newly touched bar, which was touched on the north pole of the magnet, becomes a South pole; and that which was touched on the South pole of the magnet, becomes a North pole.

To touch Compaſs Needles.

Having two ſtrong magnetical bars, lay the compaſs needle as nearly North and South as may be, the intended North end Northwards. Join the two magnets in a line conſiderably above the compaſs needle, the North end of each being Northwards;

wards; and bring them down upon the needle ſo that the place of junction may be over its center. Then draw them aſunder along each half of the needle, and continue their motion till they are more than eight inches clear of its ends. By a circular motion bring them again to their former place, and join them as before. Repeat this operation, always taking care not to turn either of the magnets out of its parellеliſm; and after five or ſix reiterations, the needle will be ſufficiently magnetical.

The bearing of any object may be taken by looking at it directly over the center cap of the card, and the point of the compaſs which ſtands directly towards the object is its bearing. There are compaſſes made and fitted up for the particular purpoſe of taking bearings. They are called *azimuth compaſſes*, and differ from the common in having the outward edge of the card divided into degrees, counted from North and South; and on the upper part of the box, which is likewiſe graduated, is attached a moveable index with ſights.

We have obſerved, that the magnetical bar or needle when at liberty, conforms itſelf *nearly* to the plane of the meridian, or North and South diameter of the horizon; there being few places at which it lies accurately in that line. The compaſs therefore, in moſt places, can only ſhew the bearing of an object nearly; and the difference or angle formed between the poſition of the needle and the true meridian, is called the *variation of the compaſs*. The variation is always reckoned from the North, that is, if the North end of the needle vary to the Eaſt of North, the variation is ſaid to be Eaſterly; and if it vary to the Weſt, the variation is ſaid to be Weſterly. The direction and quantity of the variation is not the ſame in all places, neither does it continue unchanged for a length of time at any given place.

For meaſuring arcs of the horizon, the Mariner's compaſs, or ſome equivalent inſtrument, is generally made uſe of; but for meaſuring altitudes or arcs of the azimuth circles, the quadrant is commonly applied. Let CDE, Fig. 59, repreſent a quadrant or quarter of a circle, made of braſs or other convenient materials. On the radius CE are fixed two upright pieces of braſs, in each of which is drilled a ſmall hole, thro' which objects are to be viewed. The arc or limb DIE is graduated from D towards E, into degrees and ſubdiviſions, according to the magnitude of the inſtrument. And from the center C is ſuſpended a plumb line CP. Let G be an object whoſe altitude is required. Look at it through the ſights on the radius CE, holding the quadrant upright, and the number of degrees, &c. comprehended in the arc DI, or the angle formed between the radius DC and the plumb-line, will be the altitude required.

For continue the plumb-line PC upwards to F, and thro' C; draw AB at right angles to FC. Then will the angle ACG be the altitude or angular height of G. Now by conſtruction the angles ACG, GCF, are together equal to a right angle, and the angles DCI, ICE, are together equal to a right angle; and the angles GCF, ICE, are equal; (theo. 2. ſect. 2.) becauſe they are vertical. From the right angle ACF, take the angle GCF, and from the right angle DCE take the equal angle ICE, and the remaining angles (axiom 2.) ACG, DCI, will be equal. Which was to be proved.

Theſe quadrants are called *mural quadrants* when they are fixed to the wall of an obſervatory. They are ſometimes made very large, and are fitted up with a teleſcope inſtead of ſights on the radius, and the graduations are performed to an aſtoniſhing degree of accuracy. But the oſcillations to which the plumb-line is ſubject at ſea, render them abſolutely unfit for naval purpoſes, tho' the ſimplicity of their conſtruction induced us to inſert a deſcription in this place.

Altitudes, as well as all other angular diſtances in the heavens, are meaſured at ſea by Hadley's quadrant, an inſtrument ſo very much ſuperior to every other portable contrivance, which has yet been made uſe of for the purpoſe of meaſuring angles, that it is really ſurprizing that land ſurveyors and others have not long ago ſubſtituted it in the place of the more inaccurate, clumſy and expenſive inſtruments they make uſe of. This quadrant, Fig. 60, for ſuch it is in effect, conſiſts of an arc or limb BC of 45°, firmly attached to two radii AB, AC; and the index paſſes thro' the center K, upon which it moves or turns. Upon the index near the axis is fixed a plane ſpeculum E, or mirror of glaſs quick-ſilvered: this ſpeculum is perpendicular to the plane of the quadrant, and is ſet in a braſs frame, which by means of two ſcrews behind it, (not the ſmall ſcrews by which the glaſs is faſtened in) may be replaced in the perpendicular ſituation, if by any means it ſhould loſe its adjuſtment.

On the radius AB is fixed two or more tranſparent coloured glaſſes, ſet in braſs, and jointed into a ſtem, ſo that they may either be turned down before the ſpeculum E, or turned back out of the way. On this radius likewiſe is fixed two other ſpeculums, F and G, uſually called horizon glaſſes. They are only quick-ſilver'd in part: the glaſs F is quick-ſilvered on the part or half next the quadrant; the other half being left tranſparent, and the back of the frame being cut away, ſo that it may be ſeen through. The edge of the foil of this glaſs is nearly parallel to the plane of the inſtrument, and ought to be very ſharp and neat without the leaſt flaw. The other horizon glaſs G is quick-ſilvered all over except a ſlip or narrow part in the middle, which is bounded by lines likewiſe parallel to the plane of the quadrant. Each of theſe glaſſes is ſeverally ſet upon an axis which paſſes thro' the wood work, and is provided with a lever on the back face of the radius, by the help of which the glaſs may be turned a few degrees on its axis; and as it is neceſſary they ſhould be perpendicular to the plane of the quadrant, there are two ſunk ſcrews that paſs thro' the circular plates to which the frames are ſcrewed, by tightening or ſlackening which reſpectively it is eaſy to place the glaſſes in that ſituation. Laſtly, at I is a ſight or perforated piece of braſs, thro' which the obſerver looks into the glaſs F, and at H is another ſight, thro' which the obſerver looks into the glaſs G.

The uſe of Hadley's Quadrant.

The obſerver muſt in the firſt place become acquainted with the diviſions on the limb, and on the ſmall arc which is carried by the index. The limb is divided from right to left into 90 primary diviſions, which are to be counted as degrees, and each degree is ſubdivided into three equal parts, which are therefore of 20 minutes each. The arc on the index contains the meaſure of 7 degrees or 21 of the ſmaller diviſions, but is divided into 20 equal parts. It ſerves to read off the 20th parts of thoſe ſmaller diviſions, that is to ſay, minutes of degrees. For example: if the little dot or ſtar in the middle of the arc ſtand between any two diviſions on the limb, the quantity is to be read by taking the number of the ſmalleſt of the two adjacent primary diviſions as degrees, and as many times twenty minutes as there are whole ſecondary diviſions between that primary diviſion and the center line of the index. To this quantity add as many minutes as are denoted on the arc of the index by that line of diviſion which happens to be directly oppoſite one of the lines on the limb. It is common to ſay, the dividing plate cuts at this or that diviſion or number of minutes: the minutes are to be counted from the central line to the right hand for the firſt ten, and from the left hand ten to the central line for the following ten. In the quadrants uſually made of eighteen inches radius, it is eaſy to eſtimate half minutes by the help of a double convex lens or magnifier.

The principle upon which this admirable contrivance for meaſuring the ſmall parts of lines is built, is, that if two equal lines be divided into aliquot parts, ſo that the number of parts in the one line may be one leſs than the number in the other line, then ſhall the difference between one of the ſaid parts of the one line, and one of the ſaid parts of the other line be a fraction of one of the parts conſidered as unity, and its value will be expreſſed by taking 1 for the numerator, and for the denominator, the number of the parts contained in the line to which the part conſidered as unity does not belong: for if one line be divided, for example, into 21 aliquot parts, and another equal line into 20 aliquot parts, and the 21ſt part be conſidered as unity, then the 20th part will be expreſſed by the fraction $\frac{21}{20}$ and the difference between theſe parts will be $\frac{21}{20}-1=\frac{1}{20}$. And contrarywiſe, if the 20th part be conſidered as unity, the 21ſt part will be expreſſed by the fraction $\frac{20}{21}$; whence the difference will be $\frac{20}{21}-1=\frac{1}{21}$ of this laſt unity *.

Since the arc on the index is equal to 21 diviſions on the limb, tho' it is only divided into 20 parts, it follows from this, that the diviſions on the index exceed thoſe on the limb by $\frac{1}{20}$ part of the latter. Therefore when the middle line of the arc on the index ſtands oppoſite to one on the limb, the two adjacent lines on the arc will extend each $\frac{1}{20}$ part, or 1 min. without or beyond the two adjacent lines on the limb. And if the index be moved forward till the adjacent line on the arc becomes oppoſite the adjacent line on the limb, it will have advanced one minute. By the ſame argument, if it be moved forward till the ſecond line to the right of the middle line on the arc becomes oppoſite the line next following on the limb, it will have advanced another minute, that is to ſay, in the whole two minutes. This reaſoning may be applied to any diviſion on the arc of the index.

Previous to actual obſervation, it is neceſſary to be aſſured that the ſpeculums are properly adjuſted. For this purpoſe the

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* Let two equal lines or arcs be divided, the one into m and the other into $m+1$ parts. Then if a part of the former be called unity, the difference of the parts will be $1-\frac{m}{m+1}=\frac{1}{m+1}$. But if a part of the latter be called unity it will be $\frac{m+1}{m}-1=\frac{1}{m}$ Hence it is a general rule in this method of dividing inſtruments, that, the number of diviſions on the arc of the index muſt be equal to the number of parts into which a ſingle part on the limb is required to be divided; and the length of the ſaid arc in parts of the limb, muſt be equal to one more than that number.

the index muſt be ſet at o or the beginning of the diviſions on the limb, and fixed there by the ſcrew at the back; and the obſerver muſt look thro' the ſight I, into the horizon glaſs F at the edge of the ſea, or ſome other very diſtant object. He will then behold the ſea thro' the unquickſilvered part of the glaſs, and in the quickſilvered part he will ſee a reflection of the ſame, which is afforded by the great ſpeculum E. If the horizon ſeen by reflection meet exactly, and form one continued line with that ſeen thro' the glaſs, the inſtrument is in a great meaſure adjuſted; but if it do not, the milled ſcrew of the lever on the back ſide muſt be looſened, and the horizon glaſs moved on its axis till that is effected; at which time the lever muſt be again ſecured by the ſcrew. This adjuſtment is performed while the quadrant is held upright; but now let the obſerver incline the quadrant on one ſide as much as poſſible, provided he ſtill ſees the horizon in both parts of the glaſs F. If in this ſituation the edge of the ſea continues to form one unbroken line, the quadrant is perfectly adjuſted. But if the reflected horizon becomes ſeparated from that ſeen by direct viſion, it is a proof that the ſpeculums are not both perpendicular to the plane of the inſtrument. Suppoſe the obſerver to have inclined to the right or with the face of the quadrant upwards, and that the reflected ſea appears higher than the real ſea; this will be remedied by ſlackening the ſcrew which is before the horizon glaſs, and tightening that which is behind; but if the reflected ſea appear loweſt the contrary muſt be done.

This laſt part of the adjuſtment by inclining the quadrant is almoſt generally neglected. It is true that it is not of ſo much importance as the other part, and when once performed may not be required to be done again for a long time: but the firſt adjuſtment, namely, by the lever at the back of the quadrant, ought to be examined into very often, that is, at leaſt before and after every aſtronomical obſervation. Thoſe who are deſirous of being particularly accurate, will find it adviſeable, after adjuſting as near as poſſible by means of the lever, to move the index; and after bringing it back ſo as again to cauſe the ſea to form a continued line, obſerve whether it ſtands exactly at o. If it do not it will exhibit a quantity to be added or ſubtracted from the obſervation according as the index ſtands beyond or before o.

Obſervations taken by means of the horizon glaſs F are called fore obſervations, becauſe in them both objects are before the obſerver; but when the glaſs G is uſed, the obſervation is called a back obſervation, becauſe one of the objects is behind or at the back of the obſerver. The fore obſervation is made by ſetting the index at o, and looking directly ly at the brighter of the two objects, the quadrant being at the ſame time held nearly in the plane, which may be ſuppoſed to paſs thro' both objects and the eye of the obſerver. Then gently move the index forward, and the object will ſeem to part in two by the ſeparation of the reflected image from the object itſelf. Continue to advance the index, and follow the reflected image by moving the whole body of the quadrant after it; by which means the reflected image will be brought very near the other object ſeen directly thro' the glaſs. By a gentle libration of the whole quadrant, the reflected image may be made to deſcribe a circular arc, paſſing and repaſſing by the object ſeen directly. If the two objects do not ſeem to touch, the index muſt yet be advanced; if they ſeem to coincide or lie upon each other, it muſt be moved back; and when the reflected image in the libration ſeems with its extreme edge exactly to touch the extreme edge of the other object, the obſervation is made, and the number of degrees and minutes cut by the index on the limb is the angular diſtance between the objects, or more properly between their edges or extremities. When the reflected image is too weak to be ſeen in the clear part of the horizon glaſs, the obſerver muſt look at it in the quick-ſilvered part, making uſe of the inner hole of the ſight; but this method being attended with an uncertainty in marking the coincidence ſhould be avoided when it can be. And on the contrary, if the reflected object be too luminous, as is almoſt always the caſe with the ſun, and at night with the moon, one or more of the ſcreens K muſt be turned down to intercept part of the light as it paſſes from E.

The fore obſervation on common quadrants of this conſtruction extends only to the admeaſurement of angles which do not exceed 90°; but in order to make it uſeful as far as 180°, the horizon glaſs G and its ſight is added. There are few occaſions at ſea for making uſe of the back obſervation, and it is far from being ſo eaſy in practice as the fore obſervation; for which reaſon navigators ſeldom pay any attention to it. Indeed there is one conſiderable objection to its uſe, which is, that its adjuſtment is very difficult. The method of adjuſting it conſiſts in meaſuring the diſtance between two objects whoſe diſtance is nearly 180°. The arc paſſing thro' both objects muſt be meaſured in both its parts, and if the ſum of the parts be 360° the ſpeculums are adjuſted; but if not, the axis of G muſt be moved till that ſum is obtained. But as the want of objects in an horizontal direction at ſea renders this method inconvenient, the horizon glaſs may be nearly adjuſted thus: with ſome other inſtrument find the angular diſtance of two objects which are farther apart than 90°, and ſet the index to its ſupplement, then look thro' the ſight H, into the horizon glaſs G; and if the one object ſeen by reflection coincide with the other ſeen directly thro' the unſilvered part, the glaſs is adjuſted as far as relates to the ſituation of the axis on which it is mounted; but if the objects do not coincide, the glaſs muſt be moved by means of the lever on the back of the quadrant, as already ſhewn in the fore obſervation, till the coincidence is obtained.

The uſual method to make this adjuſtment, is to ſet the index as far behind o as twice the dip of the horizon amounts to; then look at the horizon thro' the ſlit in G, and at the ſame time the oppoſite edge of the ſea will appear by reflection inverted, or up-ſide-down. By moving the lever of the axis of G if neceſſary, cauſe theſe edges to coincide and the adjuſtment is made.

There is but one poſition in which the quadrant can be held with the limb downwards, without cauſing the reflected horizon to croſs the part ſeen by direct viſion. If on trial this poſition be found to be that in which the plane of the quadrant is perpendicular to the horizon, no farther adjuſtment is neceſſary than the above deſcribed; but if the horizons croſs each other when the quadrant is held upright, obſerve which part of the reflected horizon is loweſt. If the right hand part is loweſt, the ſunk ſcrew which is before the horizon glaſs muſt be tightened, after ſlackening that which is behind the glaſs; but if the right hand part be higheſt, the contrary muſt be done. This laſt adjuſtment is of much leſs conſequence than the former, as an error in this does not affect the angle meaſured near ſo much as an error in the other.

The occaſions in which the back obſervation is to be applied are when the altitude of the ſun or a ſtar are to be taken, and the fore horizon is broken by adjacent ſhores; or when the angular diſtance between the moon and the ſun, or a ſtar exceeds 90°, and is required to be meaſured for determining the longitude at ſea. But there are objections to its uſe in both theſe caſes: for if a known land lie a few miles to the northward or ſouthward of the ſhip, the latitude, if required, may be known from its bearing and diſtance, without having recourſe to obſervation: and again, if the diſtance of the land in miles exceed the number of minutes in the dip, as is almoſt always the caſe in coaſting along an open ſhore, the horizon will not be broke, and the fore obſervation may be uſed. And laſtly, if the land be too near to uſe the fore obſervation, its extreme points will in general be ſo far aſunder as to prevent the adjuſtment by taking away the back horizon. In the latter caſe, of meaſuring the angular diſtances of the heavenly bodies, the very great accuracy required in theſe obſervations makes it a matter of importance, that the adjuſtment ſhould be well made, and frequently examined into. But the quantity of the dip is varied by the pitching and rolling of the veſſel; and this variation which is perceptible in the meaſuring altitudes by the fore obſervation, is doubled in the adjuſtment for the back obſervation, and amounts to ſeveral minutes. It is likewiſe exceedingly difficult, in a ſhip under way, to hold the quadrant for any length of time, ſo that the two horizons may not croſs each other: and in the night the edge of the ſea cannot accurately be diſtinguiſhed. All theſe circumſtances conſpire to render the adjuſtment uncertain.

The fore obſervation is ſubject to none of theſe inconveniencies. For the dip does not require to be conſidered in its adjuſtment; neither is it of any conſequence whether the quadrant be held quite ſteady or no; and at night the convex edge of the moon may be uſed, inſtead of the edge of the ſea, with the utmoſt eaſe and accuracy. For theſe reaſons, there are inſtruments made, which extend as far as 120° on the limb, and are only fitted for the fore obſervation. They are called ſextants; and, for the greater accuracy, they are uſually provided with a ſmall teleſcope, to be ſubſtituted in the place of the ſight at I, and a ſcrew fitted to the front of the index, by which it may be moved more ſlowly and gradually than it could be done, merely by the hand.

The quadrants and ſextants which are made in England, at the price of two guineas and a half, or upwards, may in general be depended upon to the accuracy of one minute; and the greater part of obſervers can make their obſervations to that degree of exactneſs, without uſing the teleſcope. It is reckoned better to obſerve cloſe, than open, that is, to be well aſſured that the objects touch each other; and this general opinion is well founded, becauſe many perſons are near-ſighted without knowing it, and ſee diſtant objects a little enlarged by the addition of a kind of penumbra, or indiſtinct ſhading off into the adjacent air. An accurate obſerver will find it beſt to uſe himſelf to the teleſcope, and, by the help of a convex lens, may eſtimate the quantity on the limb to lower parts than it is divided into, as has already been noted.

To chuſe a good Quadrant or Sextant.

In the firſt place, all the joints of the frame muſt be extremely firm and cloſe, without the leaſt opening or looſeneſs whatever, and the ivory on the limb inlaid ſo as not to riſe at either end above the plane of the inſtrument. Secondly, all the dividing lines, both on the limb and index, muſt be very fine and neat, ſo that when the center line on the index plate is ſet againſt any diviſion on the limb, the two adjacent diviſions on the index plate may ſtand perceptibly, without the two adjacent diviſions on the limb. Obſerve likewiſe by trial in different parts of the limb whether the diviſions on the index plate cut regularly in order with thoſe on the limb. If this laſt trial ſhould fail, the graduations are uncommonly bad. Thirdly, look into the great ſpeculum, holding it very ſlantwiſe, about ten inches from the eye, and obſerve the image of ſome diſtant object carefully: if the edges of the image appear clear and well defined in every part of the glaſs, the ſpeculum is good; but if it appear notched, or drawn over with ſmall lines, the glaſs is veiny, and muſt be rejected. If more images than one of the ſame object are ſeen, it is a proof that the two ſurfaces of the glaſs are not parallel; an imperfection in many caſes as bad as that of having veins. The other ſpeculum muſt be examined in the ſame manner. Laſtly, obſerve the ſun or a candle through the dark glaſſes ſeverally, holding the glaſs about ten inches from the eye; if they are veiny, the object will be notched at the edges, but if it be well defined and perfect, the glaſs is good.

Theory of HADLEY's *Quadrant.*

Lemma. The angle formed between a ray of light falling on any poliſhed ſurface, and a line drawn perpendicular to the ſurface at the point of incidence, is equal to the angle made between the ſame perpendicular and the reflected ray.

Let AB, (fig. 61.) repreſent a ray of light falling on a mirror whoſe ſection is repreſented by the line CD, and BE the ſame ray reflected, draw GB perpendicular to AB at the point B, and the angle ABG will be equal to the angle GBE.

The truth of this is eſtabliſhed by experiment.

THEOREM I.

If two plane mirrors be ſet at right angles with a given plane, and an object be ſeen by a ray of light once reflected from each mirror, the acute angle formed between the incident part of the ray, prolonged if neceſſary, and the part reflected to the eye ſhall be equal to twice the angle of the inclination of the mirrors to each other. Fig. 62.

Demonſtration. Let the paper repreſent the given plane, HI and KL plane mirrors ſet at right angles to the paper, and A an object in the ſame plane; then the object A may be ſeen in the direction DE, by means of the ray of light AB reflected from HI into the line BE, and from KL into the line

ED. Prolong AB till it meets ED in D; alſo prolong KL and HI till they meet in G; at the point B draw BM perpendicular to HI, and at the point E draw EC perpendicular to KL, and meeting HG in C: and the angle EDA, formed between the prolongation of the incident ray AB and the part ED reflected to the eye, ſhall be twice the angle EGB, or the inclination of the mirrors.

For the angles HBA, IBE are equal, becauſe they are the complements of the angles ABM, MBE, which by the lemma are equal; and the angle IBD is equal to the angle HBA (by theor. 2) and therefore equal to IBE. Again, the angle BEC is equal to the angle CED by the lemma.

Now in the triangle CEG, which is right angled at E, the two acute angles CGE, GCE are together equal to one right angle (coroll. 2, theor. 5).

But the angle GCE is equal to the angles CBE, CEB taken together (theor. 6); therefore the angles CGE, CBE, CEB are together equal to one right angle.

And in the triangle BED the angles EBD, BED, EDB are all together equal to two right angles (theor. 5).

But the angle EBD is equal to twice the angle CBE, and the angle BED is equal to twice the angle CEB; therefore the angle EDB, together with twice the angle CBE and twice the angle CEB is equal to two right angles.

And by axiom 3, twice the angle CGE, together with twice the angle CBE, and twice the angle CEB, is equal to two right angles.

Whence by axiom 2, twice the angle CGE is equal to the angle EDB.

Which was to be proved.*

Scholium. An inſtrument conſiſting of two plane reflectors ſet perpendicular to a plane, together with an apparatus for meaſuring their inclination, may be applied to the meaſuring of angles. For if the eye be at D, and one object be ſeen directly in the line DE, while another object is ſeen in the ſame line after two reflections of the viſual ray, the meaſure of the inclination of the mirrors will be half the angle, formed by the rays proceeding from each object directly to D; and this laſt angle may be read off on the arc which meaſures the inclination, if that arc be graduated ſo that half degrees may ſtand for whole ones. Such an inſtrument is Hadley's quadrant; and though the angle it meaſures is the angle contained between lines drawn from the objects to the moveable point D, inſtead of the place of the eye, which is fixed in all angles, yet the error vaniſhes when the objects are very remote; and is in all caſes inconſiderable, if the ſpeculums be as near each other as convenience may allow.

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* This theorem has two caſes; one, in which the ray ED croſſes the prolongation of AB; and the other, in which it croſſes AB itſelf. The demonſtration of the latter caſe is omitted, becauſe it is not uſed in Hadley's quadrant.

It is evident, in the adjuſtment of Hadley's quadrant for the fore obſervation, that the ſpeculum muſt be parallel when the ſame remote object is ſeen both directly and by the double reflection in the ſame place. For in this caſe the ray AB is parallel to ED, the angle ADE becomes nothing, and its half, or the angle EGB, muſt alſo be nothing; that is, the ſpeculums are not inclined to each other, and therefore are parallel (def. 8).

THEOREM II.

If two plane mirrors be ſet at right angles with a given plane, and an object be ſeen by a ray of light once reflected from each mirror, the acute angle formed between the prolongation of the incident part of the ray and the prolongation of the part reflected to the eye, ſhall be equal to twice the complement of the angle of the inclination of the mirrors. Fig. 63.

Demonſtration. Let the repreſentations be as in the laſt figure. Prolong AB and DE till they meet in d; alſo prolong KL and HI till they meet in G; at the point B draw BM perpendicular to HI, and at the point E draw EC perpendicular to KL, and prolong it to meet HG continued in c. Then the angle EdA, formed between the prolongations of the incident ray and of the part ED reflected to the eye, ſhall be twice the complement of the angle EGB, or the inclination of the mirrors.

For the angles KED, LEB are equal, becauſe they are the complements of the angles DEC, CEB, which, by the lemma, are equal; and the angle GEd is equal to the angle KED (by theor. 2) and therefore equal to LEB.

Conceive the mirror KL to become placed in the ſituation CN, the line EG will then be perpendicular to it at E, and the ray BE will be reflected in the line Ed, making the angles BEG, GEd equal. Likewiſe the angle EcB will be the inclination of the mirrors, and will be leſs than a right angle, becauſe it is one of the acute angles of the right angled triangle GEc.

Therefore, by the firſt theorem of this chapter, the angle EdB is equal to twice the angle EcB.

But the angle EcB is equal to the complement of the angle of the inclination EGB. For the angle EGB is equal to the angles EcB, cEG taken together, (theor. 6) and cEG is a right angle; EGB, therefore, exceeds a right angle by the quantity of the angle EcB; that is, the angle EcB is equal to its complement.

Whence the angle EdB being equal to twice the angle EcB, is equal to twice the complement of the angle EGB.

Which was to be proved.

Scholium. The back obſervation of Hadley's quadrant is referable to this theorem. For the adjuſtment is made by ſetting the mirrors at right angles to each other; that is, two remote objects, at 180° diſtance apart, are ſeen coincident in the direction DO; the one by the two ſucceſſive reflections, and the other directly. In this caſe the ray AB is parallel to Ed, the angle AdE becomes nothing, and its half, or the complement of the angle EGB muſt alſo be nothing. The angle EGB itſelf, or the inclination of the ſpeculums, muſt conſequently be a right angle. And when any other two objects are ſeen coincident in this manner, the diſtance of the index from O on the limb, will denote the exceſs of the inclination of the mirrors above 90°, or the complement of their inclination, which will be doubled by the method of graduating the limb. Inſtead, therefore, of the complement, its double, or the angle AdE is read on the limb; and this angle is the ſupplement of the angle AdO, formed by rays proceeding from each object.

C H A P. VI.

OF THE METHODS OF FINDING THE LATITUDES AND LONGITUDES OF PLACES.

IF the ſurface of the earth were a plane, the ſituations of places might be relatively determined from their bearing and diſtance; but on the globe lines drawn in the continual direction of any point of the compaſs, except the four cardinal points, will be curves of that kind called ſpirals. It is the property of theſe curves to wind about a point towards which they either continually approach, or continually recede; and it is evident that the rhumb lines have the ſame relation to the poles. From the difficulty which would attend the management of theſe lines in practice, they are never uſed except in the conſideration of diſtances in which they may, by reaſon of their ſhortneſs, be taken for right lines. The ſituation of places is moſt conveniently determined by their latitude and longitude.

If the latitude and longitude could be accurately found by celeſtial obſervation, or otherwiſe at ſea, the art of navigation would be complete. But this cannot yet be done: for tho' the latitude may be obtained as correctly as can be deſired, yet the methods of finding the longitude are neither eaſy to be put in practice, nor ſafe to be depended on. We are to ſpeak more largely concerning the application of Trigonometry to this purpoſe; but ſhall in this place explain what relates to obſervation.

All obſervation of the celeſtial bodies is primarily intended to diſcover their true place with regard to the circles ſuppoſed to be drawn in the heavens and chiefly thoſe which reſpect the horizon, that is, azimuth circles or parallels of altitude; and in order to avoid error, it is neceſſary to attend to ſuch circumſtances as tend to deceive us in this matter. One of the chief of theſe is the refraction or bending out of their courſe which the rays of light ſuffer in their paſſage from the celeſtial luminaries to our eyes. The uninſtructed may obtain an idea of this refraction from the following experiment. Place an empty baſon or other veſſel in the direct light of the ſun; or a candle, ſo that one half or a conſiderable part of its cavity may be illuminated, and the other half ſhaded by the intervening ſide of the veſſel. Obſerve the line which bounds the confines of light and ſhadow, and mark its place by laying a piece of money on the bottom of the veſſel, or by any other means. Then without moving any part of the apparatus, fill the veſſel gently with water. The conſequence will be, that the ſhadow will ſeem to withdraw itſelf, and a much greater part of the cavity of the veſſel will be illuminated than before. Here it is evident that the rays of the ſun or candle which paſſed in a ſtrait line by the edge of the veſſel when empty, become refracted or bent when they enter the denſe body of the water, and fall more perpendicularly on the bottom of the veſſel than before. And ſimilarly, the light of the heavenly bodies paſſing out of the void celeſtial ſpace into the denſer air which environs the earth, falls more perpendicularly than it would otherwiſe have done. Theſe bodies, therefore, are always beheld by us at a greater altitude than they really have. Table IX. contains the quantity to be ſubtracted from every obſerved altitude on account of refraction.

The altitudes of objects at ſea are obſerved by bringing them down to the edge of the ſea by Hadley's quadrant, as has already been ſhewn. But this angle is not only too great on account of refraction, but likewiſe on account of the dip, or depreſſion of the viſible horizon; the nature of which is explained in chap. 1. of the preſent ſection. Table VIII. contains the quantity to be ſubtracted on account of the dip, according to the height of the eye of the obſerver. Obſervers at ſea generally chuſe to ſtand in the ſhip's waiſt when they take altitudes, becauſe the height of the eye above the water is not ſo much altered by the motion of the ſhip; but this is of no conſequence; for in rough weather the edge of the ſea beheld from a ſmall elevation is made uneven by waves whoſe altitudes amount to 2 or 3 minutes or more, which circumſtance produces as great an uncertainty as the riſe and fall of the object ſeen from the poop when the ſhip pitches. Theſe are minute cauſes of error, but not to be diſregarded by thoſe who wiſh to obtain habits of accuracy and exactneſs.

Altitudes of the ſun being uſually taken by bringing his lower limb in apparent contact with the horizon, it is evident that the quantity of the ſun's ſemi-diameter muſt be added to give the altitude of his centre. Or if becauſe of clouds, or for other reaſons, the altitude of the upper limb be taken, the ſemidiameter muſt be ſubtracted to give the altitude of his center. For all aſtronomical calculations reſpecting the heavenly bodies are fitted to their centres. The mean ſemidiameter of the ſun is 16 minutes, which may be taken as a conſtant quantity in common obſervations, becauſe the greateſt variation from this quantity ſcarcely exceeds one quarter of a minute.

In taking altitudes of the ſun, it is uſual to take the dip from the ſemi-diameter of the ſun, and neglect refraction. The remainder is a conſtant correction always to be added to the apparent altitude of the lower limb. This may do very well for meridian altitudes when conſiderable, but in low altitudes the refraction is too conſiderable and various to be either neglected or allowed for by gueſs, as is frequently done.

The meridional altitude of the ſun at places when it riſes and ſets is found by attending a few minutes before noon, and taking its altitude from time to time. When the ſun's altitude remains for ſome time without any ſenſible increaſe, the obſerver muſt be attentive to mark the coincidence of the limb of the ſun with the horizon till it perceptibly dips below the edge of the ſea. The ſituation of the index muſt not then be altered before the quantity it marks is read off. This quantity is the meridional altitude.

PROBLEM I.

To find the Latitude of a Place from an obſerved greateſt meridian Altitude of a celeſtial Body.

Rule. If the zenith diſtance and declination be of the ſame name their difference, but if not their ſum is the latitude, of the ſame name with the declination, except when the declination is ſubtracted from the zenith diſtance.

Demonſtration. The parallels of latitude on the earth are correſpondent with the parallels of declination in the heavens; and, therefore, the latitude of any place anſwers to the declination of its zenith. The declination of the zenith of a place may be readily found if its meridional diſtance from an object whoſe declination is known be given.

For if the object lie in the ſame direction both from the zenith and the equator, the equator itſelf will paſs at ſuch a diſtance from the zenith as is equal to the difference between the zenith diſtance and declination of the object. If the declination be greater than the zenith diſtance, the equator will lie on the oppoſite direction from the zenith, and conſequently the zenith will lie on the ſame ſide of the equator as the object; its declination or the latitude of the place being of the ſame name as the declination of the object. But if the declination of the object be leſs than its zenith diſtance, it is plain that the equator muſt paſs between the object and the zenith, and the latitude or difference between the zenith diſtance and declination will be of the contrary name to the declination.

But if the zenith diſtance and declination of the object be of different names, it is evident that the object muſt be between the zenith and the equator. The diſtance between the zenith and the equator, or the latitude, muſt, therefore, be equal to the zenith diſtance of the object added to its declination. And becauſe the zenith lies on the ſame ſide of the equator as the object, the latitude will always be of the ſame name as the declination.

Which was to be proved.

This general rule gives the latitude, by obſerving the greateſt meridian altitude; and it ſeldom happens that the leaſt meridian altitude is made uſe of. For it is to be noted, that any celeſtial object, whoſe co-declination or diſtance from the elevated pole is leſs than the altitude of the pole itſelf, can never ſet or paſs beneath the horizon but may be ſeen on the meridian twice in 24 hours; once at its greateſt, and once at its leaſt altitude.

PROBLEM II.

To find the Latitude of a Place from an obſerved meridian Altitude of a celeſtial Body beneath the elevated Pole.

Rule. The co-declination added to the altitude, gives the latitude of the ſame name with the declination.

Demonſtration. The co-declination, or diſtance of the object from the pole added to the altitude of the object, gives the altitude of the pole. Now the zenith diſtance or co-altitude of the pole is the complement of the latitude or diſtance between the zenith and equator, becauſe the pole is 90° diſtant from the equator; the altitude of the pole muſt therefore, be equal to the altitude: and becauſe the zenith is on the ſame ſide the equator as the pole towards which the declination is made, the latitude will be of the ſame name as the declination.

Examples for finding the Latitude by meridian Obſervation.

Example 1. Being at ſea, July 29, 1779, the meridian altitude of the ſun's lower limb was obſerved to be 34° 10′ N. the eye of the obſerver being 25 feet above the ſea. The latitude of the place is required.

The ſun's declination for the *third year after leap year on July 29, is found in Table X. to be 18° 46′ N. the dip for 25 feet elevation is 5 minutes, the refraction for 34° is 1 minute, therefore

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* The annual courſe of the ſeaſons, or the natural year, conſiſting of nearly 365 days 6 hours, and the current year being reckoned 365 days, it is evident that one whole day would be loſt in four years if the ſix hours were conſtantly rejected. To avoid this inconvenience, which, if not attended to, would cauſe the ſeaſons to ſhift in proceſs of time through all the months in the year, an additional day is added to the month of February, every fourth year; this fourth year is termed leap year, and is found by dividing the year of our Lord by 4; leap year leaves no remainder; other years are called the firſt, ſecond, or third years after leap year, according as the remainder is 1, 2, or 3.

Altitude of ſun's lower limb 34° 10′ N.
Add Semidiameter 16
34 26
Subtract dip and refraction 6
Correct altitude 34 20
Zenith diſtance or co-alt. 55 40
Subtract declination 18 46 N.
Remains latitude 36 54 S. or of the contrary name to the declin.

Example 2. October 26, 1780, ſun's meridional altitude, lower limb 62 09 S. required the latitude. Height of the eye 30 feet.

1780 is leap year, and the ſun's declination in October 26, is 12° 45′ S. The dip for 30 feet elevation is 6 minutes, the refraction for 62° is ½ minute. Therefore

Sun's apparent alt. l. l. 62° 09′ S.
+ ſemidiam.— dip and refrac. 9 ½
Correct alt. 62 18 ½
Zenith diſ. 27 41 ½ S.
Sun's declination 12 45 S.
Difference is lat. 14 56 ½ N. or of the contrary name

Example 3. Jan. 7, 1776, altitude of ſun's lower limb, at noon 87° 10′ S, height of the eye 30 feet, required the latitude.

Sun's apparent alt. l. l. 87° 10
+ ſemidiam.— dip. 10 refraction being inconſiderable
Correct alt. 87 20
Zenith diſtance 2 40 S.
Sun's declinat. 19 13 N.
Sum is latitude 21 53 N.

Example 4. In the year 1778, July 30, the ſun's meridian altitude lower limb was 84° 10′ N. Required the latitude. The height of the eye being 30 feet:

Sun's apparent alt. l. l.	84° 10′
+ Semidiam. — dip.	10
Correct alt.	84 20
Zenith diſt.	5 40 N.
Sun's declination	18 28 N.
Difference is lat.	12 48 N.

Example 5. Being at ſea in the year 1777, cloſe weather prevented the meridian obſervation of the ſun, but the night proving clear, the northernmoſt ſtar in the ſquare of the Great Bear was obſerved to come to its leaſt altitude 30°10′.—Required the latitude: the height of the eye being 20 feet.

Star's altitude apparent	30° 10′
— Dip and refraction	6½
Correct altitude	30 03½
* Star's co-declination	27 03 N.
Sum is latitude	57 06½ N. by Prob. II.

Example 6. June 11, 1770, the ſun's meridian altitude of the upper limb below the pole was obſerved to be 2° 08′. The height of the obſerver's eye being 16 feet.—Required the latitude.

Sun's apparent altitude upper limb	2° 08′
— dip, refraction, and ſemidiam.	38
Correct alt.	1 30
Sun's declin. 23° 08′ N. its comp.	66 52 N.
Sum is latitude	68 22 N.

From theſe rules and examples it is plain that the latitude may be obtained without difficulty, and generally as often as nautical purpoſes require. The motion of the earth on its axis prevents the longitude from being obſerved with the ſame facility; and on this account, moſt methods of finding the difference of longitude, by celeſtial obſervation, are adapted to diſcover the difference of apparent time between the two places under conſideration.

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* The places of the brighteſt fixed ſtars are to be found in the *Tables requiſite to be uſed with the nautical Ephemeris.*

Time is a part of duration which is conceived to flow or be generated uniformly. It has no meaſure that we are acquainted with in nature. Motion is ſaid to be uniform when the ſpaces moved through are ever as the correſpondent portions or parts of time; and becauſe motion is more eaſy to be conceived than time, any motion which is ſuppoſed to be uniform is taken as the meaſure of time. The rotation of the earth on its axis is very probably uniform, and is therefore taken as the meaſure of equal parts of time; an intire rotation meaſuring a day, $\frac{1}{24}$th part of a rotation meaſuring an hour, &c. Some remarkable circumſtance is taken to mark the beginning of the day. The riſing or ſetting of the ſun was the earlieſt adopted for this purpoſe, but the obvious inequality of the days and nights, compared with each other, makes it neceſſary to reckon the lapſe of time rather from the coming of the ſun to the meridian of the place of obſervation, which happens nearly after equal intervals of time. The civil reckoning of time is made from midnight to midnight, ſo that noon, or the time of the ſun's coming to the meridian, is the middle point or inſtant of the day. Aſtronomers begin the day at noon, and are therefore twelve hours later than the civil time; but navigators end the day at noon, and are therefore twelve hours earlier in their reckoning of the day than the civil time, and a whole day before the aſtronomers.

Since the beginning of the day is determined from a circumſtance which does not happen at the ſame inſtant of abſolute time to every part of the globe, it is evident, that the day of one place is not univerſally the ſame part of time as the day of another. For the rotation of the earth cauſes the ſun to come apparently to the meridian of a given place, and it is then noon at that place; and ſucceſſively to every place in order to the weſtward, it becomes noon in ſucceſſive inſtants of time. So that as the ſun paſſes over a whole circle of the earth in 24 hours, by an apparent motion nearly uniform, the difference of time between the noon of one place and another, will always be the ſame proportional part of 24 hours, as the difference of their longitudes is of 360°. And the difference between any two like hours of the day, will be the ſame quantity. It is likewiſe obvious, that the Eaſternmoſt place will have the ſun earlier than the other. The effect which the obliquity and unequal velocity of the Sun, in his apparent annual courſe, has upon the length of days, is not here attended to. The quantity

tity of this effect is called the *Equation of time*, and is to be applied in moſt aſtronomical obſervations.

The problem of finding the difference of longitude between two places, may be reduced to that of finding the apparent difference of the ſame inſtants of abſolute time at each of them. Thus, if an obſerver at a certain place at three o'clock in the afternoon, could, by any means, be aſſured that it was then ten o'clock in the morning at another certain place, he would from thence know that he was 75° to the Eaſtward of the latter place; becauſe the whole day, or 24 hours, is to the difference of time 5 hours, as 360° is to 75°, and it is three o'clock at the place of the obſerver before it is yet noon at the latter place, therefore the place of the obſerver is the Eaſternmoſt.

The time, at any given place of obſervation, may be found by obſervation of the apparent ſituation of the ſun or a ſtar, and the time at another known place may be had by means of a time-keeper or watch, previouſly ſet to the time of this latter place, by obſervations taken on the ſpot. But altho' great improvements have been made in the art of conſtructing clocks and watches, it does not ſeem probable that they will, for a long time to come, be made ſufficiently accurate and cheap for common uſe; and the probability of accidents is a circumſtance which can never be intirely obviated. It is therefore to be wiſhed that the longitude could be diſcovered by other means.

With this intention the celeſtial phenomena are to be obſerved. For it is evident, that if any event be obſerved, the time of whoſe happening, at a given place, is foreknown by calculation, the difference between the time of obſervation and the calculated time, will be the difference of longitude in time between the place of obſervation and the given place. Example, September 30, 1773, the beginning of an eclipſe of the moon was obſerved at 6 h. 35 m. in the afternoon. The longitude of the place of obſervation is required?—By the nautical ephemeris, the time of the beginning at Greenwich is 4 h. 31½ m. the difference therefore is 57½ m. which anſwers to 14° 22½′ longitude, and is to the Eaſtward, becauſe the obſerved time precedes the other. But eclipſes of the moon happen too ſeldom to be adequate to the general purpoſe of finding the longitude at ſea.

The planet Jupiter is accompanied by four moons, among which eclipſes almoſt daily happen. Theſe eclipſes afford an excellent method for finding the longitude of places on ſhore, but as they require to be viewed with a teleſcope, which magnifies very conſiderably, the motion of the ſhip prevents their being obſerved at ſea. This difficulty may, perhaps, be ſurmounted by ſkill and attention. For, in moderate weather, an obſerver may avail himſelf of a more powerful teleſcope than is commonly ſuppoſed to be manageable on ſhipboard. It may be of conſequence to the obſerver to know, that diſtinctneſs and a great quantity of light are almoſt of as much importance to viſion by teleſcopes, as the enlargement of the apparent diameter. All teleſcopes will admit of a larger aperture, and repreſent objects more bright and well defined, when the magnifying power, or convexity of the eye glaſs, is leſs than the utmoſt charge the teleſcope will bear; and this difference in teleſcopes which magnify equally, is much more conſiderable than is generally ſuſpected. For example, a common refracting teleſcope, whoſe object-glaſs has its principal focus at the diſtance of one foot, cannot, in general, bear an aperture of more than half an inch, or magnify more than ten times; and an object-glaſs of the ſame kind, of ſix feet focal length, may be made to magnify forty times, with equal advantage. But if the latter be made to magnify only ten times, it will admit of an aperture of two inches, and repreſent objects ſixteen times as bright, and much more diſtinct, than the former. Such a teleſcope is, therefore, as manageable on ſhipboard as one of a foot focus; and, by reaſon of its ſuperiority in light and accuracy, will diſcover Jupiter's moons even with a ſmaller magnifying power than is here mentioned. Hence it may be preſumed, that, if a metalline ſpeculum, or achromatic object-glaſs, capable of the application of a large magnifying power, were made uſe of, with ſuch a charge as might not render it uſeleſs at ſea, as for inſtance, 25 or 30 times, the ſuperior degree of light and diſtinctneſs would compenſate for the want of apparent magnitude, and occaſions would frequently offer of diſcovering the longitude. The author of this treatiſe intends to make the experiments neceſſary to aſcertain this; but want of leiſure and opportunity induces him to recommend the trial to others.

Eclipſes are no otherwiſe uſeful than as they may be eaſily obſerved, and point out the place of the celeſtial body in the heavens, at the inſtant of obſervation, to which place the correſpondent time adapted to the firſt meridian has been previouſly calculated. Now, if the place of any celeſtial body be computed, for example, as in an almanac, for every day, or to parts of days, to the time of any given meridian, and that place can be found by obſervation at ſea, the difference between the time of obſervation and the computed time anſwering to the obſerved place of the celeſtial body, will be the difference of longitude in time, in the ſame manner as if the time had been found by means of an eclipſe. There is no celeſtial body, except the moon, which can be obſerved at ſea, whoſe diurnal change of place is conſiderable enough to mark ſmall portions of correſpondent time; and, therefore, the moon's place only muſt be attempted to be obtained by obſervation. This is done with conſiderable ſucceſs, by taking the angular diſtance between the moon and the ſun, or a ſtar, with Hadley's Quadrant.

As it may naturally be ſuppoſed, that the obſerver who intends to make uſe of this method, will furniſh himſelf with the *Nautical Ephemeris*, and the *Tables requiſite to be uſed with the Nautical Ephemeris*, publiſhed by order of the Commiſſioners of Longitude, in the latter of which are compendiums with very plain inſtructions and examples for making the computations required; it would be an unneceſſary redundancy in this book to repeat what is there laid down. We ſhall only, therefore, in this place, recommend the method as one of the moſt accurate and beſt adapted to the preſent methods of obſervation at ſea, of any in uſe.

The variation of the compaſs affords a method of determining the longitude. For, in the Southern part of the Atlantic, and in a conſiderable part both of the Pacific and Indian oceans, the quantity of the variation changes very faſt in running upon a parallel. If, therefore, a ſhip be in a known latitude, and the variation of the compaſs be found by obſervation, it will be eaſy to determine the longitude, provided the obſerver be furniſhed with a chart or table of the longitudes correſponding with given quantities of latitude and variation. It is a valuable property of this method, that it gives the longitude the moſt accurately in thoſe parts of the world where ſhips ſailing from Europe are moſt particularly in need of it. The principal impediment to its uſe, is the want of a chart or table, which, on account of the change which the variation ſuffers in time at any given place, ought to be frequently renewed, from ſea journals, at the public's expence. A ſecond impediment is a want of care and attention in obſerving the ſun's magnetical and true azimuths: for the needle of the card is not always fixed as accurately beneath the N. and S. line as it ought to be, and navigators ſeldom take the pains to examine into it; and, in finding the true azimuth, they are, in general, very careleſs in their allowance for refraction.

The laſt method of finding the longitude at ſea, is that which is univerſally practiſed. It conſiſts of trigonometrical calculations made with the courſe and diſtance run by the ſhip in the ſpace of 24 hours. For every ſhip at ſea is kept as near her deſtined courſe as circumſtances admit, and her hourly velocity is meaſured by an inſtrument called the *Log*, which conſiſts of a ſmall quadrant of wood, whoſe limb, or arc, is loaded with lead, ſo as to float nearly upright; this is attached to a line called the *Log-line*, which is divided into parts called *Knots*. The log being thrown overboard, is ſuppoſed to remain ſtationary in the water, and a conſiderable part of the line next the log is left undivided, that the log may be clear of the eddy part of the ſhip's wake, before they begin to note the quantity of line run out. At the inſtant the beginning of the diviſion paſſes through the hand of the obſerver, he gives notice to an aſſiſtant who turns a half-minute glaſs; and, at the inſtant the half-minute glaſs is out, the aſſiſtant ſays, *Stop*, upon which the obſerver graſps the line, and prevents any more from runing out. The number of knots and fathoms are entered, together with the courſe, winds, &c. in a book, called the *Log-Book*. The knots anſwer to miles; the meaſure of a diviſion of the line being the ſame proportional part of a geographical mile, as half a minute is of an hour: that is, one hour, or 120 half-minutes, is to 1 half-minute, as one geographical mile, or 6092 feet, is to 50¾ feet. But it is uſual to make the diviſions or knots each 8 fathoms, or 48 feet, the difference being ſuppoſed to anſwer for the coming up of the log towards the ſhip, inſtead of remaining ſtationary.

The computation founded on theſe data, is called the *Dead-Reckoning*, and is ſubject to many cauſes of error. The log can only ſhew the velocity at the end of the hour, and the velocity may have changed ſeveral times between the times of heaving the log: the diſtance run is not, therefore, very accurate, even if tides and currents be put out of the conſideration. The courſe, beſides, is not accurately made, and eſpecially when a ſhip is cloſe hauled, it is continually varying from the ſhifting of the wind, not to mention that the allowance of lee-way is, at beſt, a groſs and unſcientific way of gueſſing.

C H A P. VI.

TO FIND THE VARIATION OF THE COMPASS.

AS it is of great importance to know the variation of the compaſs at ſea, not only to correct the courſes ſailed, but likewiſe, in ſome caſes, to determine the longitude, as ſhewn in the laſt chapter, it will be proper to ſhew how to make the obſervations required for this purpoſe, and thence to make the neceſſary computations. But the demonſtrations are omitted, becauſe they depend on ſpherical trigonometry, which the intended brevity of this work has prevented us from treating upon.

The bearing of any celeſtial object may be found by calculation, if its declination, altitude, and the latitude of the place of obſervation be known. The bearing is called its *Amplitude*, or *true Amplitude*, when the object itſelf is in the horizon; but if it be elevated above the horizon, the bearing is called its *Azimuth*, or *true Azimuth*. The word *true* is prefixed to the amplitude or azimuth thus found, in order to diſtinguiſh them from the amplitude or azimuth taken by the compaſs, which are termed magnetical.

It is evident, that if the magnetical bearing do not agree with the true, the compaſs has variation, and the difference between them is its quantity. The variation is always reckoned from the north; and conſequently if the true bearing of the object be to the right hand of the bearing ſhewn by the compaſs, the variation is eaſterly, but weſterly if the contrary happens.

The Azimuth Compaſs is fitted up for the purpoſe of taking bearings with more accuracy than can be done by the common Bitacle compaſſes. The compaſs-box, with this intention, is made heavier, and the jimbals on which it is ſlung, to prevent the effects of the ſhip's motion, are ſtronger and better made. The card is divided on its circumference into degrees, and there are croſs lines in the box to which the cardinal points are made to agree during the time of obſervation. On the upper part of the box is a braſs circle, divided into degrees and parts correſponding with the poſition of the croſs lines within, and theſe parts are ſtill more divided by the dividing-plate of a moveable index which carries two upright ſights, or one ſight, and a thread drawn to the oppoſite part of the index, which ſerves inſtead of another ſight. Laſtly, the whole inſtrument is ſo fitted on an upright axis and caſtors, that it may be eaſily turned about into any horizontal poſition. Theſe compaſſes are ſtill capable of great improvement.

The obſervation of an azimuth for finding the variation, is beſt made by three perſons. One obſerver muſt look through the ſights, and, by moving the whole inſtrument on its axis, be careful to keep the thread conſtantly upon the ſun's diſk, ſo as to biſect it. The ſecond obſerver attends to the poſition of the card, and, by moving the index, cauſes the firſt obſerver to move the box, ſo that the croſs lines in the box may coincide with the cardinal points. The third obſerver conſtantly attends to the ſun's altitude with Hadley's Quadrant. Now, when the ſecond obſerver perceives that the card ſtands properly with the croſs lines, the index on the graduated circle ſhews the magnetical azimuth, which is noted down, together with the altitude of the ſun at the ſame time, from which the true azimuth is to be computed.

The ſecond obſerver may take the magnetical azimuth alone, when the ſun ſhines ſtrong enough to caſt the ſhadow of the thread upon the oppoſite ſight; and an expert perſon may not only do this, but even take the altitude immediately after the adjuſtment of the compaſs. But it is beſt for three to obſerve as abovementioned.

The amplitude is taken in the ſame manner as the azimuth.

It is cuſtomary, and with great reaſon, to take a conſiderable number of azimuths, for example, ſix or ſeven, and find the variation from each The mean of all theſe will be nearer the truth than any ſingle reſult.

The navigator ought to be aware, that the quantity of refraction differs very much in low altitudes, and that it is conſequently very abſurd to make any conſtant allowance, as many obſervers do The refraction ought to be taken out of the table for every altitude. It is likewiſe to be remarked, that the vulgar error of taking the ſun's amplitude at the time his center is apparently in the horizon, is ſtill very prevalent, though long ſince exploded by many writers. The true time to take the amplitude is when the ſun's lower limb is ſomewhat more than a ſemidiameter above the horizon, becauſe his center is then really in the horizon, as may be eaſily underſtood from the table of refractions.

PROBLEM I.

Given the Latitude of the Place, and the Declination of a Celeſtial Object, to find its true Amplitude.

Solution. As co ſine lat. : radius : : ſine declination : ſine of amplitude reckoned from the eaſt or weſt, and of the ſame name as the declination.

But, as it is generally required to have the amplitude from the north point of the horizon, this amplitude from the E. or W. muſt, if north, be taken from 90°; or, if ſouth, be added to 90°; and this difference or ſum will be the true amplitude reckoned from the north.

This problem may be expeditiouſly ſolved by Gunter's Scale, and alſo by Table XI.

PROB.

PROBLEM II.

Given the Latitude of the Place, the Declination and Altitude of a Celeſtial Body, to find its true Azimuth.

Solution. If the latitude and declination be of the ſame name, the declination taken from 90°; but, if they be of different names, the declination added to 90° will be the polar diſtance from the elevated pole.

Find the ſum of the co-latitude, the co-altitude, and the polar diſtance. Halve this ſum.

Find the difference between the polar diſtance and the half ſum.

Then find the ſum of the four following logarithms.

The arith. com. of the log. ſine of the co-latitude.
The arith. com. of the log. ſine of the co-altitude.
The log. ſine of the above named half ſum.
The log. ſine of the above named difference.

Half this ſum is the co-ſine of an arc, which doubled, is the true azimuth reckoned from the north, if the latitude be north; but from the ſouth, if the latitude be ſouth. Conſequently in ſouth latitude, if it be required to have the azimuth from the north point of the horizon, as in general is moſt convenient, the ſupplement of the azimuth thus found muſt be taken.

Examples of Amplitudes and Azimuths.

Example 1. In latitude 28° 10′ N. the ſun's declination being 18° 59′ N. the ſun was obſerved to riſe by the compaſs N. 70° 30′ E. It is required to find the variation of the compaſs?

Coſine lat. = 28° 10′—9,94526
: Radius - - 10,
: : Sine Decl. = 18 59 — 9,51227
Sine true amp = 21° 39′ 9,56701
Or true amp. ſ. N. 68 21 E. becauſe the ſun is riſing.

Magnetic Amp. = 70° 30′ E.
True Amp. = 68 21 E.
Dif. is variation = 2 09 W. becauſe the true bearing is to the left of the bearing by compaſs.

Example 2. In latitude 33° 17′ S. the ſun's declination being 12° 10′ N. and his obſerved altitude 3° 12′ his magnetical azimuth was N 54° 12′ W. Required the variation of the compaſs?

To find the true azimuth.

Co-lat. 56° 43′ Ar. co.-log. ſine 0.07781
Co-alt. 86. 48 Ar. co.-log. ſine 0.00068
90°+12°10′=Polar diſ. 102. 10

Sum = 245. 41

Half Sum = 122. 50 Sine — 9.92441

Differ. = 20. 40 — Sine — 9.54768

19.55058

53° 25′ Co-ſine 9.77629

Doubled = 106. 50 = Az. from S.

Supplement = 73. 10 = Az. from N.
Magnet. az. = N. 54. 12 W.

Diff. = variation = 18. 58 W. becauſe the true azimuth is to the left of the magnetical azimuth.

Example 3. In lat. 0° 11′ N. the ſun's declination being 4° 06′ S. and his obſerved altitude 6° 07′, his magnetical azimuth was N. 96° 09′ W. and his magnetical amplitude at ſetting, was N. 96° 06′ W. Required the variation both from the azimuth and amplitude?

To find the true azimuth.

89° 49′ 0.00000
83. 53 0.00248
90°+4° 6′ — 94. 6

267. 48

133. 54 9.85766

39. 48 9.80625

19.66639

47° 04′ 9.83319

94. 08 = az. from N.
Mag. az. N. 96. 09 W.

Variation 2. 01 E. becauſe the true azimuth is to the right hand of the mag. azimuth.

To find the true amplitude.

Cos. lat.	0° 11′	9.99999
Rad.		10.
Sine dec.	4° 06	8.85429
Sine amp.	4° 06	8.85428
Or, N.	94 06 W.	
Mag. am.	96 06	

Variation 2 00 E. becauſe the az. is on the right hand of the mag. az. This Ex a: wrong ye Var: 10 Exact: 7

Example 4. In latitude 40° 38′ N. the ſun's declination being 17° 10′ S. his obſerved altitude was 20° 46′, and his magnetical azimuth N. 126° 00′ W. Required the variation of the compaſs?

Anſwer, 11° 50′ W.

Example 5. In latitude 16° oo [illegible] the ſun's declination being 22° 58′ S. his obſerved al[illegible] 30° 22′, and his magnetical azimuth N. 120° 43′ E. [illegible] is required to find the variation of the compaſs?

Anſwer, 13° 07′ W.

Example 6. In latitude 62° [illegible]′ N. the ſun's declination being 14° 26′ S. the ſun was obſerved to riſe by compaſs N. 137° 20′ E. Required the variation?

Anſwer, 15° 08′ W.

BOOK

BOOK II.

NAVIGATION.

CHAP. I.

OF THE PLANE CHART, AND OF RIGHT-ANGLED PLANE SAILING.

IT is abſolutely neceſſary to a traveller, that he ſhould be acquainted with the ſituation of thoſe places to which he intends to go. And as the ſituations of places on the earth is known from their latitudes and longitudes, a ſufficiently correct and copious table of latitudes and longitudes, or an equivalent to ſuch a table, is one of the helps which a navigator ought not to be without. For this reaſon Table XII. is annexed to this work. A table of this kind is ſuſceptable of the advantage of denoting the ſituation of places to any required degree of accuracy; but, at the ſame time, it muſt be confeſſed, that names and numbers convey a very imperfect notion of theſe ſituations to the imagination. This laſt purpoſe is more effectually anſwered by the uſe of maps or charts, which, in general, are drawings or pictures of the face of the earth and ſea, as it would appear to an eye at a ſufficient diſtance. Theſe may be called true charts, which are either globes or delineations according to the rules of perſpective, but neither of theſe are made uſe of at ſea, becauſe of the few ſtrait lines they contain. The charts uſed at ſea, are either plane charts, or mercator's charts. In the plane chart, the meridians and parallels of latitude, are right lines at right angles to each other; conſequently, it has all its meridians parallel to each other, and all its parallels of latitude equal. It is, therefore, uſeful only in ſmall ſpaces of the earth's ſurface which do not much differ from planes; ſuch, for example, as the ſpace run over by a ſhip in a day, or the extent of a bay or harbour. This kind of chart may be made uſe of for ſeveral degrees of latitude on each ſide of the equator, becauſe the meridians are there almoſt parallel. The mercator's chart is ſimilar to the plain chart, excepting that the degrees of the meridian are not equal, but enlarged towards the poles; by which contrivance it acquires many valuable properties. Of this we are to ſpeak in future.

Conſtruction of the Plane Chart.

Draw two right lines parallel to each other acroſs the paper, one at the top, and the other at the bottom. At right angles to theſe, draw two other parallel lines, one near the right hand, and the other near the left hand extremity of the paper. Divide the two firſt lines, each into a like number of equal parts, within the points of interſection formed by the croſſing of the other two right lines. And divide the other two right lines in like manner into parts, each equal to a part of the firſt lines. Then the two firſt lines will repreſent the extreme parallels of latitude, and the two latter the extreme meridians of the intended chart; and the ſubdiviſions on each, will repreſent degrees, miles, leagues, or any other meaſures which may beſt ſuit the purpoſe of the deſigner. If one of the parallels be ſuppoſed to repreſent the equator, the diviſions of the meridians muſt be numbered from thence; but if not, the diviſions muſt be reckoned from the latitude of that parallel which is neareſt the equator. And ſo, likewiſe, if one of the meridians be ſuppoſed to repreſent the firſt meridian, the diviſions of the parallels muſt be reckoned from thence; but if not, the diviſions muſt be reckoned from the longitude of that meridian which is neareſt the firſt meridian, that is to ſay, as far as 180°, and thence back again. Through every tenth diviſion of the meridians draw a parallel acroſs the chart; and through every tenth diviſion of the parallels draw a meridian.

In ſome convenient part of the chart, draw a mariner's compaſs, and continue the rhumb lines to the extremities of the chart. In moſt charts, the top of the book or paper is made north, the bottom conſequently is ſouth, the right hand eaſt, and the left hand weſt.

Places are delineated or marked on the chart, by drawing a parallel through the latitude of the place, on each graduated meridian; and a meridian through the longitude of the place, on each graduated parallel: the point of interſection of the parallel and meridian thus drawn, will give the required ſituation of the place. Coaſts are laid down by marking a ſuffi-

cient

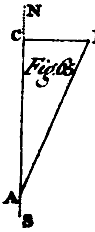


Fig. 65

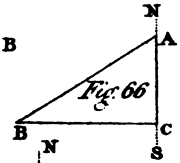


Fig. 66

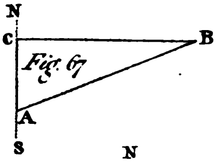


Fig. 67

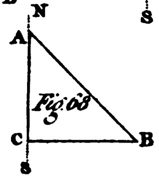


Fig. 68

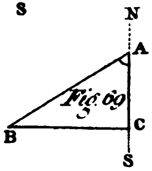


Fig. 69

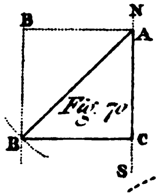


Fig. 70

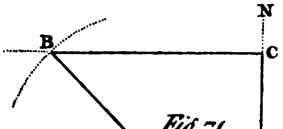
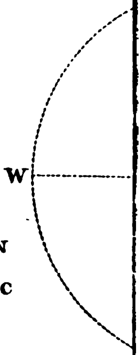


Fig. 71



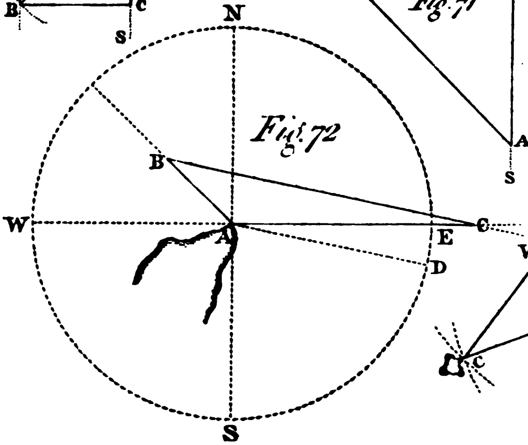
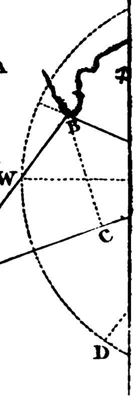


Fig. 72



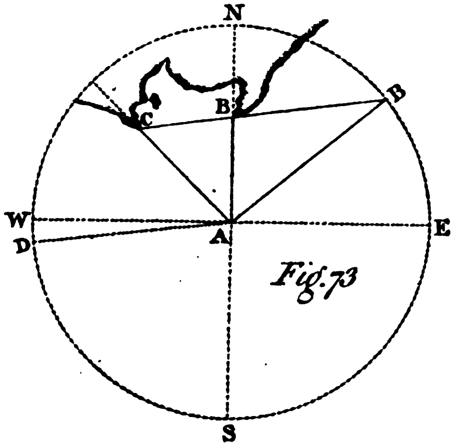


Fig. 73

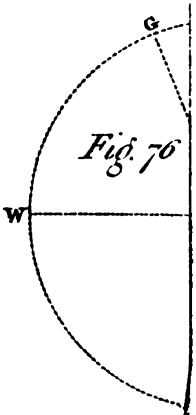


Fig. 76

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cient number of points from the known latitudes and longitudes of places on the coaſt, and the coaſt itſelf is drawn by the hand through thoſe points. In all ſea charts, the line of the coaſt is gradually ſhaded off on the land ſide, to denote the riſe of the land above the water. This may be done either with the pen or Indian ink.

The ſituation of a place may be marked on the chart, if the bearing and diſtance of a given place in the chart be known. For, draw a line from the given place, parallel to that rhumb of the compaſs which denotes the bearing, and on this line, ſet off the diſtance in parts of the graduated parallel or meridian. The extreme point of the diſtance marks the place required.

The operator will ſoon obſerve, that places may be delineated on the chart by the help of the parallels and meridians already drawn, without having recourſe to a multiplicity of other lines.

Computation is ſo much more accurate than delineation, and the helps of tables are ſo many, that charts are ſeldom uſed but in coaſting navigation.

Of Plane Sailing.

Plane Sailing is the method of deducing a ſhip's place, or of determining things relating to the navigating a ſhip upon the principles of the plane chart.

The courſe is the acute angle formed between the line deſcribed, or propoſed to be deſcribed, by a ſhip under way, and the meridian from which ſhe is departing.

Diſtance, is the right line, or rather rhumb, deſcribed on any ſingle courſe.

Difference of latitude, is the diſtance between two parallels of latitude, and is meaſured on the meridian. It is frequently called *Northing*, or *Southing*.

Departure, is the diſtance on the plane chart between two meridians, and is meaſured on a parallel of latitude. It is frequently called *Eaſting*, or *Weſting*.

Difference of longitude, is the diſtance between two meridians, and is meaſured on the equator. On the plain chart it is the ſame as departure.

It is abſolutely neceſſary, that the navigator ſhould be able to box the compaſs, as it is called, that is, to repeat the names of the points in order from memory, either backwards or forwards, and to tell readily the diſtance of any point of the compaſs from the meridian, either in points or degrees and minutes. For this purpoſe, the figure of the compaſs, (fig. 64.)

is there drawn, with places containing the numbers denoting thoſe diſtances. But the cards at ſea have neither letters nor figures on them.

The following rules do not require any explanation.

1. If the latitudes of two places be given, their difference of latitude may be found, by taking the difference of the two latitudes, if of the ſame name, or their ſum, if of contrary names.

2. If one of two latitudes be given, together with the difference of latitude, the other latitude may be found, by taking the ſum of the given quantities, if of the ſame name, or their difference, if of contrary names; and the latitude found, will be of the ſame name with the greater given quantity.

3. If the longitudes of two places be given, their difference of longitude may be found, by taking the difference of the two longitudes, if of the ſame name, or their ſum, if of contrary names. But if this ſum exceeds 180°, its ſupplement is the difference of longitude.

4. If one of two longitudes be given, together with the difference of longitude, the other longitude may be found, by taking the ſum of the given quantities, if of the ſame name, or their difference, if of contrary names; and the longitude found, will be of the ſame name with the greater given quantity.

Theſe two laſt rules are applicable likewiſe to departure.

Hence follows a collection of examples in plain ſailing on a ſingle courſe.

EXAMPLE I. Fig. 65.

A ſhip in latitude 37° 10′ N. ſails NNE. 80 miles; it is required to find her difference of latitude and departure?

Conſtruction.

Draw an unlimited line NS, to repreſent the meridian ſailed from, the upper part N, being underſtood to be north. From any aſſumed point A in NS, draw the line AB, making the angle CAB=2 points, or 22° 30′, the angle of the courſe NNE: the line AB being drawn upwards, becauſe the courſe is northerly, and to the right hand of NS, becauſe it is likewiſe eaſterly; make AB=80 miles, or the diſtance; and let fall the perpendicular BC, from B, upon the line NS.

The line AC will be the difference of latitude, and CB the departure.

Com-

EXAMPLE V. Fig. 69.

A ſhip in latitude 30° 05′ N. ſails SE*b*E. till her departure is 46 miles. What is her preſent latitude, and what diſtance has ſhe run?

Conſtruction.

Draw the meridian NS, and from any point A in the ſame, draw the parallel of latitude Ab to the eaſtward = 46 miles, or the eaſting. From A draw AB in the SE. quarter, unlimited towards B; and making the angle BAC=56° 15′, or the courſe. From b draw bB parallel to AC, and interſecting AB in B. Draw likewiſe BC parallel to bA, and interſecting AC in C.

The line AB will be the diſtance, and AC the difference of latitude.

Computation.

Sin. Co. ∠A=56°15′	9.91985	Si.co. ∠A=56°15′ ar.co.	0.08015
: Depart. CB=46	1.66276	: Dep. CB=46	1.66276
: : Radius - - - - -	10.	: : Coſi. Co. 33°45′	9.74474
: Diſt. AB = 55.3	1.74291	: Diff. lat.=30.7	1.48765

Now the difference of latitude is ſouthing, and therefore of a different name from the given latitude. Their difference, or 30° 05′—31′=29° 34′, is the preſent latitude, which is north, becauſe the greater of the two quantities is north.

EXAMPLE VI. Fig. 70.

A ſhip ſails on a ſoutherly courſe 118 miles, and makes 83 miles weſting. Her courſe and difference of latitude are required.

Conſtruction.

Draw the meridian NS, and from any point in it A, draw the parallel of latitude Ab, to the weſtward, = 83 miles. From b, draw bB parallel to AC, and unlimited towards B. With the extent 118, or the diſtance, from A deſcribe an arc cutting bB in B. Join AB and draw BC parallel to bA, and interſecting the meridian in C.

The angle BAC will be the courſe, and AC the difference of latitude.

Computation.

Diſtance AB = 118		2.07188	Radius - - - -		10.
:Radius - - - -		10.	Diſtance AB = 118		2.07188
::Depart. CB = 83		1.91908	Coſine Courſe	45° 18′	9.85137
:Sin. Co. ∠A =	44° 42′	9.84720	Diff. lat.	83.8	1.92325

EXAMPLE VII. Fig. 71.

A ſhip from latitude 1° 04′ S. ſails between the N. and W. 162 miles, and then finds her latitude by obſervation to be 52′ north. It is required to find her courſe and departure.

Conſtruction.

Draw the meridian NS, and upon it ſet off AC = 1° 56′, or 116 miles, the difference of latitude. From C, the latitude come to, draw the parallel of latitude CB unlimited to the weſtward. From A, the latitude ſailed from, with the extent AB = 162 the diſtance, deſcribe an arc interſecting the parallel in B; and join AB.

The angle BAC will be the courſe, and CB the departure.

Computation.

Diſtance AB = 162		2.20951	Radius - - - -		10.
:Radius - - - -		10.	:Diſtance AB = 162		2.20951
::Diff. lat. AC = 116		2.06456	::Sine Courſe	44° 15′	9.84372
:Coſine Courſe	45° 45′	9.85505	:Departure	113	2.05323

EXAMPLE VIII.

There are two iſlands A and B, and the iſland B bears WNW. of A. Now a ſhip, after running 30 miles due weſt from A, obſerved the iſland B to bear north. What is the diſtance of the two iſlands?

Anſwer, 32.5 miles, or 11 leagues nearly.

EXAMPLE IX.

A King's ſhip ſails, upon a due ſouth courſe, 62 miles from a port in latitude 18° 10′ N. at which time ſhe ſpeaks with a merchantman who had obſerved a privateer of the enemy cruizing in the ſame latitude, viz. 18° 10′ N. The merchantman's courſe from thence was ESE. How far diſtant is the privateer, ſuppoſing her not to have changed her ſtation?

Anſwer, 162 miles.

EXAMPLE X.

A ſhip ſailing from the iſland of St. Helena, ran due north till ſhe arrived at the parallel of latitude of the iſland Aſcenſion, after which, ſteering due weſt 470 miles, ſhe arrived at the latter iſland. What is the direct courſe and diſtance from St. Helena to Aſcenſion?

Anſwer, N. 44° 13′ W. diſtance 674 miles.

EXAMPLE XI.

A ſhip in ſight of Cape St. Vincent's bearing W*b*S. diſtant 9 leagues, finds her latitude by obſervation 36° 46′ N. The latitude of the Cape is required?

Anſwer, 36° 41′ N.

EXAMPLE XII.

A ſhip in latitude 49° 10′ N. and longitude 10° 12′ W. is bound to a port in Ireland. What is the courſe and diſtance to Cape Clear?

Anſwer, N. 12° 33′ E. diſtance 118 miles.

CHAP. II.

OBLIQUE PLANE SAILING.

THOUGH almoſt every thing which occurs in the practice of navigation, may be ſolved by the uſe and application of right-angled triangles, yet there are many inſtances, eſpecially in coaſting or ſurveying of harbours, which are much more readily and elegantly ſolved by the help of oblique-angled triangles, and ſome which can be ſolved no other way. This method of ſolution is uſually termed *Oblique Sailing*. Here follows a collection of examples.

EXAMPLE I. Fig. 72.

A ſhip ſailing on a NW. courſe, at the rate of 5 knots an hour, obſerves a head-land bearing E. and four hours afterwards the ſame head-land bore S. 78° E. What was its diſtance at the laſt time it was ſet?

Conſtruction.

With the radius or chord of 60°, deſcribe the circle NESW, repreſenting the horizon; through the center of which, draw the meridian NS, and the parallel of latitude WE. From A, draw AB=20 miles on a NW. courſe; becauſe 5 knots or miles per hour, for four hours, make that quantity. Draw AC on an eaſt courſe, unlimited towards C. Draw AD, likewiſe, on a S. 78° E. courſe, by ſetting off from S the arc SD = 78°. And parallel to AD, through B, draw BC, which will make the ſame angles with NS towards the ſame part, (Theor. 3. ſect. 2. book 1.) and conſequently will be on the ſame rhumb as AD. Prolong BC till it meets AC in C.

The ſide BC of the triangle ABC is the diſtance required.

Computation.

In the triangle ABC, the angle BAC=∠BAN+∠NAE=45°+90°=135°. And the angle ACB, is equal to the difference of the bearings or poſitions of the lines CA and CB from the point C; that is, between weſt and N. 78 W. or 90°—78=12°. Therefore,

Sine ∠C = 12° ar. co. 0.68213
:Side AB = 20 1.30103
::Sine∠A= 135° 9.84948
:Side BC =68 1.83264

EXAMPLE II. Fig. 73.

Running on a NE½E. courſe at the rate of ſix knots, at eleven A. M. * the eaſt point of Praya Bay, on the iſland of St. Jago, bore N. and the weſternmoſt point, or Point Tubaron, bore NW. At noon both points in one † bore S. 84° W. It is required to determine how wide the entrance of the bay is?

Con-

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* A. M. ſignifies *Ante Meridiem*, or before noon; P. M. ſignifies *Poſt Meridiem*, or afternoon. Seamen read them by naming the letters as they ſtand.

† When two objects, as for example, pilots' marks, points of land, &c. are ſeen on the ſame rhumb or bearing; ſo that the remoteſt is immediately behind the nearer object, they are ſaid to be *in one*.

Conſtruction.

Deſcribe the horizon with the meridian and parallel of latitude, as in the laſt example. From A draw AB, NE½E=6 miles. Draw likewiſe Ab north, unlimited towards b, AC NW. unlimited towards C, and AD S. 84 W. Parallel to AD, through B, draw BC interſecting Ab and AC in b and C.

The line bC is the width of the bay, or diſtance of its extreme points, as required.

Computation.

In the triangle ABC, the angle ACB is equal to the difference of the bearings or poſitions of the lines CA and CB from the point C; that is, between SE. and N. 84° E.=51°. And the angle ABC is equal to the difference of the bearings or poſitions of the lines BA and BC from the point B; that is, between S. 50° 7½′ and S. 84°W. or 84°—50° 7′½=33° 52′½. Therefore,

Sine ∠ACB=51°	ar. co	0.10950
: Side AB = 6		0.77815
:: Sine ∠ABC=33° 52½′		9.74615
: Side AC = 4.3		0.63380

And in the triangle AbC, the angle AbC is equal to the difference of the bearings or poſitions of the lines bA and bC from the point b; that is, between S. and S. 84 W.=84°. And the angle bAC is is equal to the angle of the bearing of C from A; that is, NW. or 45°.

Sine ∠ AbC = 84°	ar. co.	0.00239
: Side AC = 4.3		0.63380
:: Sine ∠bAC = 45°		9.84948
: Side bC = 3.06		0.48567

EXAMPLE III. Fig. 74.

A ſhip at ſea, ſailing NNW at the rate of 6½ knots, obſerved, at day break, that ſhe had juſt paſſed near a dangerous reef of rocks. Continuing her courſe for 8 hours, ſhe then made the land bearing NE*b*E, diſtant 10 leagues. It is required to find the bearing and diſtance of the reef of rocks from this land?

Conſtruction.

Deſcribe the horizon with its meridian and parallel as before. Make AB=52 miles on a NNW courſe. Draw AD, NE*b*E, and through B draw BC parallel to AD. Upon BC, from B, ſet off 30 miles towards the ſame ſide of the line AB as AD is drawn from. Join AC, which continue ſouthward towards G.

The angle SAG is the bearing, and the line CA is the diſtance of the reef of rocks from the land.

Computation.

In the triangle ABC, the ſides AB, BC are known, and the angle at B is the difference of the bearings of the lines BA and BC from B; that is, between NE*b*E and SSE$=$9 points of the compaſs, or $101^\circ\ 15'$. Therefore,

The ſum of the ſides $=AB+BC=82$ ar. co. 8.08619
: Their difference $= AB-BC=22$ 1.34242
: : Tang. $\frac{1}{2}$ ſum $\angle$s not included $=39^\circ\ 22\frac{1}{2}'$ 9.91416

: Tangent $\frac{1}{2}$ their difference $=$ $12^\circ\ 25'$ 9.34277

$\frac{1}{2}$ Sum $+$ $\frac{1}{2}$ difference $=$ $51\ 47\frac{1}{2}=$ the greater $\angle$ by theo. 13. And $\angle$BCA is the greater $\angle$, becauſe it is oppoſite AB the greater ſide, by theo. 7. ſect. 2. book 1. And the leſſer $\angle$ BAC will be$=26^\circ\ 57\frac{1}{2}'$.

Sine $\angle BCA = 51^\circ\ 47\frac{1}{2}$ ar. co. 0.10470
: Side $AB = 52$ 1.71600
: : Sine$\angle ABC=101^\circ\ 15'$ 9.99157

: Side $AC = 64.9$ 1.81227

Now, the bearing of C from A is meaſured by the angle NAC, and the angle $NAC=\angle BAC-\angle BAN=26^\circ\ 57\frac{1}{2}-22^\circ\ 30'=4^\circ\ 27\frac{1}{2}$ to the eaſtward of north, or N. $4^\circ\ 27\frac{1}{2}$ E. And the bearing of A from C, is on the oppoſite rhumb. That is to ſay, the reef of rocks bears from the land S. $4^\circ\ 27\frac{1}{2}$ W. diſtant 64.9 miles.

EXAMPLE IV. Fig. 75.

There is a certain harbour whoſe extreme points bear ESE. and WNW. of each other, diſtant 4 miles, and in the offing to the ſouthward lies a ſmall iſland on which a light houſe is erected. Now, the boatmen who are employed to convey proviſions and neceſſaries to the iſland, reckon it to be 5 miles diſtant from the weſternmoſt point of the harbour, and 7 miles from the eaſternmoſt point. What are the bearings of the iſland from each point, ſuppoſing theſe eſtimated diſtances to be accurate?

Con-

Conſtruction.

After deſcribing the horizon with its meridian and parallel, draw AB=4 miles WNW; and the extremities of AB will repreſent the two points. From the eaſternmoſt point A, with the extent 7 miles deſcribe an arc, and from the weſternmoſt point B, with the extent 5 miles deſcribe another arc, cutting the former in C, which will repreſent the place of the iſland. Through A, draw AD parallel to BC, and on the ſame ſide of AB.

The angle SAC is the bearing of the iſland from the eaſternmoſt point A, and the angle SAD is the bearing of the iſland from the weſternmoſt point B.

Computation.

In the triangle ABC the ſides only are given. Therefore,

The baſe AC=7 ar.co. 9.15490
: S. of legs AB+BC=9 0.95424
: : Dif. legs BC—AB=1 0.00000

:Dif Seg. CG-AG=1.29 0.10914
½ Baſe = 3.5
+½ diff. ſegm. = .64

Greater ſegm. 4.14=CG

In the right-angled triangle CBG
Side CB = 5 0.69897
: Radius - - - - 10.
: : Side CG = 4 14 0.61700

: Sine∠CBG =55°54′ 9.91803

Its comp. = 34 06=∠BCG.

The angle C, in the triangle ABC, being thus found, the other angles are obtained by the ſecond fundamental theorem. That is to ſay,

Side AB = 4 ar. co. 9.39794
: Sine ∠C = 34° 06′ 9.74868
: : Side BC = 5 0.69897

: Sine ∠A = 44° 29′ 9.84559
From 180°
Take 78. 35 = ∠C + ∠A=34° 06′+44° 29′

Rem. 101. 25=∠ABC.

From a proper conſideration of theſe angles the bearings may be found.

For, the ∠SAC, or the bearing of C from A, is=∠SAB —∠CAB, and the ∠SAB=90°+∠WAB=90°+22° 30′= 112° 30′, and the ∠CAB=44° 29′. Therefore 112° 30′— 44° 29′=68° 01′=∠SAC.

Again, the line BA lies in an ESE. direction from B, and the line BC is 101° 25′ to the left hand of BA. If, therefore, from ESE. or S. 67° 30′ E. there be reckoned 101° 25′ to the left hand, the difference 33° 55′ to the weſtward of ſouth, will be the bearing of C from B. That is to ſay, the iſland bears S. 68° 01′ W. from A, and S. 33° 55′ W. from B.

EXAMPLE V. Fig. 76.

The wind being at NE, a ſhip is bound to a port bearing N½E. 18 leagues diſtant, and can make her courſe good within 6 points of the wind. How much muſt ſhe run on either tack to reach the harbour?

Conſtruction.

Conſtruct the horizon with its meridian and parallel of latitude. Draw AD, NE. and on each ſide of D in the circumference of the circle ſet off DG and DK, each equal to 6 points, and draw the lines AG, AK. Draw AC=18 leagues N½E. and parallel to (either KA or) GA, through C, draw CB, meeting the other line KA in B.

The line AB will be the diſtance on the larboard, and BC the diſtance on the ſtarboard tack *.

Computation.

In the triangle ABC, is given the ſide AC and the angles. For the angle CAB=∠CAD+∠DAK=39° 22½′+67° 30′ =106° 52½′. The angle CBA=ſupplement∠CBK=ſupplement∠GAK=45°. And the angle ACB=∠CAG=28° 07½′. Therefore,

Sine ∠B = 45° ar. co.	0.15052	Sine ∠B = 45°	0.15052
: Side AC = 18	1.25527	: Side AC = 18	1.25527
: : Sine ∠C = 28° 07½′	9.67338	: : Sine ∠A = 106° 52½′	9.98088
: Side AB = 12	1.07917	: Side BC = 24.4	1.38667

EXAMPLE VI. Fig. 77.

In the Straits of Sunda, at two P. M. ſteering SE*b*S, at the rate of 5 knots, I paſſed cloſe by the SE. of the ſmall iſlands off Hog Point. At ſix, not having changed our courſe, came to anchor on the Java ſhore. Upon ſetting the ſaid iſland from this anchoring place, I find it bears due north, its diſtanee by the chart being 22 miles. It follows from hence, that our courſe has been affected by a current. The velocity and direction of the current is required to be found?

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* A ſhip is ſaid to be on her ſtarboard tack when ſhe is as near the wind as ſhe will lie, and the wind is on the right ſide of the ſhip; but, in like circumſtances, with the wind on her left ſide, ſhe is ſaid to be on the larboard tack. The reaſon of this will be better underſtood by inſpection on ſhipboard, than by the moſt laboured explanation.

Conſtruction.

Conſtruct the horizon with its meridian and parallel. From A draw AB=26 miles SE*b*S, which will repreſent the ſhip's track through the water, and would have been her real courſe and diſtance, if the water had remained without any progreſſive motion. Draw AC=22 miles ſouth, and C will repreſent the ſhip's real place; join BC. It follows, therefore, that while the ſhip has been deſcribing the line AB, with reſpect to the water, the water itſelf has moved through a ſpace equal to the diſtance BC in the direction of that line. Draw AD parallel to BC, and on the ſame ſide of AB as BC is drawn.

The line BC will be the ſpace paſſed through by the current in four hours, and the angle CAD will be its direction or courſe.

Computation.

In the triangle ABC is given the ſides AB, AC, and the included angle A=33° 45′. Therefore,

Sum of ſides AB + AC = 42 ar. co. 8.37675
: Diff. of ſides AC — AB = 2 0.30103
: : Tan. ½ ſum ∠s not included = 73° 07½′ 10.51800

: Tan. ½ their difference = 8 55 9.19578

½ Sum + ½ differ. = 82 02½ = greater ∠ = ∠B, becauſe oppoſite the greater ſide.

Sine ∠ B = 82° 02½′ ar. co. 0.00420
: Side AC = 22 1.34242
: : Sine ∠A = 33° 45′ 9.74474

: Side BC = 12.3 1.09136

The bearing of the line BC may be gathered from its poſition with reſpect to BA, which lies N. 33° 45′ W. from B, and BC is 82° 07½′ to the left hand of BA; that is, BC is 115° 47½′ from the north, or 64° 12½′ from the ſouth. Now, the diſtance BC=12 miles, paſſed by the current in 4 hours, gives 3 miles to one hour. Conſequently the current ſets

S. 64° 12½′ W. or nearly WSW¼S. at the rate of three miles an hour.

From the conſideration of this example it is ſhewn, that a ſhip under way in a current, will, at the end of any given time, be found in the ſame place as ſhe would have arrived at in ſtill water, after deſcribing like courſes and diſtances, together with another courſe and diſtance anſwering to the direction and velocity of the current. For the ſhip, under the action of the current, arrives at the ſame place C as ſhe would have come to in ſtill water by ſailing through AB and BC; and it is evidently of no importance, in this caſe, provided the time continues unaltered, whether AB be made good on a ſingle courſe, or on a number of courſes.

EXAMPLE VII. Fig. 78.

A ſloop is bound from the main land of Africa to an iſland bearing W*b*N. diſtant 22 leagues, a current ſetting NNW. 2½ miles per hour. What is the courſe to arrive at the iſland in the ſhorteſt time, ſuppoſing the ſloop to ſail at the rate of 6 knots an hour; and, likewiſe, what time will ſhe take?

Conſtruction.

Conſtruct the horizon with its meridian and parallel of latitude. Draw AC = 22 leagues = 66 miles W*b*N. and draw AG, NNW. Upon AG ſet off AK = 25 miles, or any multiple of 2½ miles; and from K, with KD = 60 miles, or a like multiple of 6 miles, deſcribe an arc cutting AC, prolonged if neceſſary, in D. Join KD. From C draw CB parallel to KA, and from A draw AB parallel to KD and meeting CB in B.

The angle SAB is the courſe, and AB the diſtance to be run correſponding with the time. But if the velocity of the veſſel be not greater than that of the current, that is, if KD be not greater than KA, the arc will not interſect AC, and it will be impoſſible for her to reach the iſland.

Computation.

The ſloop will arrive in the ſhorteſt time at the iſland, by ſailing in a right line, (def. 5. ſect. 2. B. 1.) And by the remark on example 6, her ſituation, at the end of the time, will be the ſame as if ſhe had deſcribed her apparent courſe and diſtance in ſtill water, together with another courſe and diſtance correſponding with the motion of the current. Now, it is evident, that the apparent diſtance, or diſtance by log, AB muſt be to the drift of the current BC, as the velocity of the veſſel is to the velocity of the current, that is, as 6 to $2\frac{1}{2}$. In the triangle DKA, the ſides DK, KA, are reſpectively like multiples of 6 and $2\frac{1}{2}$, and are, therefore, (theo. 5. ſect. 1. B. 1.) that ratio. And the triangles DKA, ABC, are ſimilar, becauſe the alternate angles KDA, CAB, are equal, and the alternate angles BCA, KAD, are equal, (prob. 6. theo. 5. cor. 1. ſect. 2. B. 1.) Therefore $KD : AK :: 6 : 2\frac{1}{2} :: AB : BC$. Conſequently AB is the line which, if deſcribed apparently by the veſſel, would bring her to C, by reaſon of the drift BC. Now, to find the direction and length of this line AB,

In the triangle AKD is given AK and KD, together with the $\angle A = \angle NAC - \angle NAG = 78^\circ\ 45' - 22^\circ\ 30' = 56\ 15$. Therefore,

Side DK	=	66	ar. co.	8.18046
: Sine ∠A	=	56° 15′		9.91985
: : Side AK	=	25		1.39794
: Sine ∠KDA	=	18° 21′		9.49825

In the ſimilar triangles AKD, CBA, the $\angle KAD = \angle ACB = 56^\circ\ 15'$, and the $\angle KDA = \angle CAB = 18^\circ\ 21'$. Therefore, in the triangle ABC is given the ſide AC=66 miles and two angles. Conſequently the ∠B is likewiſe known, being = 105° 24′. Whence,

Sine ∠ B	=	105° 24′	ar. co.	0.01588
Side AC	=	66		1.81954
: Sine ∠ C	=	56° 15′		9.91985
: : Side AB	=	56.9		1.75527

The angle NAB is equal to $\angle NAC + \angle CAB = 78^\circ\ 45' = + 18^\circ\ 21' = 97^\circ\ 06'$, and the angle SAB, or the apparent courſe, is = the ſupplement of ∠ NAB which is 82° 54′. And the apparent diſtance, or diſtance by log, = 56.9, or 57 miles, run at the rate of 6 knots per hour, gives the time $9\frac{1}{2}$ hours. That is to ſay, the ſloop will reach the iſland directly in $9\frac{1}{2}$ hours, by ſteering S. 82° 54′ W. or nearly W. $\frac{1}{2}$ S.

CHAP. III.

TRAVERSE SAILING.

WE have exemplified in the foregoing chapters, the application of plain trigonometry to the ſolution of nautical queſtions. But the ſolution by logarithms is thought too operoſe for daily uſe, and it is ſeldom that mariners avail themſelves of the logarithmic lines upon Gunter's ſcale. It is now a long time ſince tables of difference of latitude and departure, commonly called *Traverſe Tables*, have been calculated; by the help of which, any perſon, though totally ignorant of the trigonometrical proportions, may readily find the parts of any right-angled triangle, provided two of them, excluſive of the right angle, be given. For, ſince the diſtance ſailed upon any courſe is the hypothenuſe of a right-angled triangle, of which the difference of latitude and departure are the legs, a table of difference of latitude and departure to a ſufficient number of diſtances regularly increaſing, and to every courſe in the quadrant conſiſting of whole degrees, will not only be uſeful for working queſtions in plane ſailing by inſpection, but likewiſe may ſerve to give a nearly accurate ſolution to many other queſtions in which right-angled triangles are concerned. Table V. is a table of difference of latitude and departure for diſtances not exceeding 300, and for courſes to every quarter point of the compaſs. Table VI. is a table of the ſame nature and extent, but for courſes conſiſting of whole degrees.

The uſe of theſe tables is eaſy. One page conſiſts of ſeveral ſets of columns, three columns in each ſet, titled at top D. Lat. Dep. but at bottom D. Dep. Lat. the letter D. denoting diſtance, Lat. difference of latitude, and Dep. departure. At the top and bottom of each page, are numbers denoting the courſe, either in points of the compaſs or degrees, and the titles at top of the columns anſwer to the courſe at top, the titles at bottom of the columns anſwering in like manner to the courſe at bottom; this muſt be carefully attended to. The difference of latitude and departure anſwering to any given courſe and diſtance, are found oppoſite the diſtance in that page of the table at the head or foot of which is the courſe. Therefore, if any two of the four things, viz. courſe, diſtance, difference of latitude, and departure, be given, and thoſe two be found together in the table, the other two things will be found together in their reſpective places on the ſame page. A very little practice will enable the learner to turn readily to any place required in the tables.

When a ſhip ſails on ſeveral different courſes, theſe courſes and diſtances conſidered together, are called a *Traverſe.*

In working a traverſe, it is obvious, if a ſhip, on ſeveral courſes, makes her differences of latitude all the ſame way, the ſum of all the differences of latitude will be the difference of latitude made good; but, if on ſome courſes ſhe makes northing, and on others ſouthing, the difference between the total northing and total ſouthing, will be the difference of latitude made good of the ſame name with the greater quantity.

And the like is true with reſpect to departure, or eaſting and weſting.

Here follow examples of traverſes worked by the table of difference of latitude and departure.

EXAMPLE I. Fig. 79.

A ſhip ſails on the following courſes, viz. SW. 25 miles, SSW. 18 miles, S*b*W. 25 miles, E. 4 miles, E*b*N. 7 miles, S. 10 miles. It is required to find the courſe, diſtance, difference of latitude and departure made good?

Conſtruction.

Conſtruct the horizon with its meridian and parallel. Set off the firſt courſe and diſtance from the center of the horizon. Draw the rhumb of the ſecond courſe from the center of the horizon; and, parallel to this rhumb, from the outer extremity of the firſt diſtance, ſet off the ſecond diſtance. Draw the rhumb of the third courſe from the center of the horizon; and, parallel to this rhumb, from the outer extremity of the ſecond diſtance, ſet off the third diſtance. And proceed, in this manner, till every courſe and diſtance of the traverſe is drawn. From the center of the horizon, to the outer extremity of the laſt diſtance, draw a right line. This right line will be the diſtance made good, and the acute angle formed between it and the meridian, will be the courſe made good. From the outer extremity of the laſt diſtance, draw a parallel of latitude falling on the meridian, prolonged if neceſſary. The eaſt and weſt line comprehended between the meridian and the outer extremity of the laſt diſtance, will be the departure;

ture; and the north and ſouth line comprehended between the firſt and laſt parallels of latitude, will be the difference of latitude.

As the conſtruction of every traverſe is performed in the ſame manner, we ſhall, for brevity, omit them in future.

Computation by the Table.

TRAVERSE TABLE.

Courſe.	Diſ.	N.	S.	E.	W.
SW.	25		17.7		17.7
SSW.	18		16.6		6.9
S*b*W.	25		24.5		4.9
E.	4			4.	
E*b*N.	7	1.4		6.9	
S.	10		10.		
		1.4	68 8	10.9	29.5
			1.4		10.9
S.15°W.	68		67.4		18.6

Make a table conſiſting of ſix columns, and title them courſe, diſtance, northing, ſouthing, eaſting, weſting, each column being intended to contain that which its title denotes. The courſes of the traverſe muſt be entered in the firſt column, and their reſpective diſtances oppoſite to them in the ſecond. Seek the firſt courſe SW. or 4 points, in the table of difference of latitude and departure, and againſt the diſtance 25, will be found 17.7 difference of latitude, and 17.7 departure, which enter in the columns of ſouthing and weſting, becauſe the courſe is in the SW. quarter. In like manner with the courſe SSW, or 2 points, againſt diſtance 18 is found 16.6 diff. lat. and 6.9 departure, which are likewiſe ſouthing and weſting. S*b*W. or 1 point, diſtance 25 gives 24.5 ſouthing, and 4.9 weſting. Eaſt, diſtance 4 miles, need not be ſought out, as the diſtance is all eaſting, and muſt, therefore, be entered in the E. column. E*b*N. or 7 points, diſtance 7 gives 1.4 northing, and 6.9 eaſting. And S. diſtance 10 miles is all ſouthing. The difference between the total ſouthing and total northing, is 67.4 ſouthing; and the difference between the total weſting and the total eaſting, is 18.6 weſting. With theſe numbers in the table of difference of latitude and departure, the diſtance is found 68, and at the top of the page 15 degrees for the courſe which is in the SW. quarter, the courſe being taken from the top and not the bottom of the page, becauſe the titles of lat. dep. at the top agree with the nature of the numbers.

The courſe, therefore, is S. 15 W. diſtance 68 miles, diff. lat. 67.4 miles N. departure 18.6 W.

EXAMPLE II.

A ſhip in 17° 12′ N. lat. bound to a port in 18° 40′ N. lat. and 220 miles to the weſtward, ſails NW*b*W. 73 miles, WNW. 40, SSW. 18. What is her preſent latitude and departure made good, and what are the bearings and diſtance of the port to which ſhe is bound?

Computation.

Lat. ſailed from 17° 12′ N.
Dif. lat. made good 39 N.

Ship's lat. 17. 51 N.
Lat. bound to 18. 40 N.

Dif. lat. to be made 49 N.

Whole departure 220 W.
Dep. made good 105 W.

Dep. to be made 115 W.

TRAVERSE TABLE.

Courſes.	D.	N.	S.	W.
NW*b*W.	73	40.6		60.7
WNW.	40	15.3		37.0
SSW.	18		16.6	6.9
		55.9 16.6		104.6
N. 21° W.	112	39.3		

With 49 miles northing, and 115 miles weſting, ſeek for courſe and diſtance in the table of difference of latitude and departure, which being found N. 67 W. diſt. 126, is the required bearing and diſtance of the port, according to the principles of plain ſailing.

EXAMPLE III.

A ſhip ſails on the following courſes, SE. 40 miles, NE. 28 miles, SW*b*W. 52 miles, NW*b*W. 30 miles, SSE. 36 miles, SE*b*E. 58 miles. Required her courſe, diſtance, diff. lat. and departure made good?

TRA-

TRAVERSE TABLE.

Courſes.	D.	N.	S.	E.	W.
SE.	40		28.3	28.3	
NE.	28	19.8		19.8	
SW*b*W.	52		28.9		43.2
NW*b*W.	30	16.7			24.9
SSE.	36		33.3	13.8	
SE*b*E.	58		32.2	48.2	
		36.5	122.7	110.1	68.1
			36.5	68.1	
S. 26° E.	96		86.2	42.0	

EXAMPLE IV.

From lat. 3° 18′ S. a ſhip ſails NNE. 22 miles, N*b*W. 30 miles, NE*b*E. 40 miles, ESE. 25 miles, SSW. 18 miles, NW½N. 50 miles, NE½E. 42 miles, W½S. 45 miles, SW*b*S. 20 miles, E¾N. 62 miles. Required her courſe, diſtance, difference of latitude and departure made good.

TRAVERSE TABLE.

Courſes.	D.	N.	S.	E.	W.
NNE.	22	20.3		8.4	
N*b*W.	30	29.4			5.8
NE*b*E.	40	22.2		33.3	
ESE.	25		9.6	23.1	
SSW.	18		16.6		6.8
NW½N.	50	38.6			31.7
NE½E.	42	26.6		32.5	
W½S.	45		4.4		44.8
SW*b*S.	20		16.6		11.1
E¾N.	62	9.1		61.3	
		146.2	47.2	158.6	100.2
		47.2		100.2	
N. 31° E.	115	99 0		58.4	

CHAP.

CHAP. IV.

OF PARALLEL SAILING.

IT has already been obſerved, that ſailing upon the principle of the plane chart is too erroneous, when applied to the ſurface of aſphere, to be uſed in any but ſmall diſtances, or between the tropics, where the meridians have but little convergency, and the rhumb lines do not widely differ from portions of great circles. In all ſea reckonings, the principles of the plane chart are ſuppoſed to be exact enough for the quantity run over in a day; and, at the end of every 24 hours, the ſhip's place is determined, in latitude and longitude, by applying the difference of latitude found by theſe principles, to the latitude ſailed from, and the difference of longitude to the longitude ſailed from. This difference of longitude is found, either by parallel ſailing, middle latitude ſailing, or Mercator's ſailing.

Of Parallel Sailing.

Parallel ſailing, is the method of finding the difference of longitude made by a ſhip, when her courſe and diſtance, run upon a known parallel of latitude, are given; and the contrary.

The computations in parallel ſailing, depend on the following theorem.

THEOREM.

On the globe, the difference of longitude between any two meridians, is to the diſtance between thoſe meridians meaſured on any parallel of latitude, as radius to the coſine of the latitude. Fig. 80.

Demonſtration. Let EQRP repreſent the fourth part of a ſphere; AECQ half the plane of the equator; GDBR half the plane of a parallel of latitude; P the pole; PBC, PRQ, two quadrants of meridians; EC, EQ, radii of the equator drawn in the planes of the meridians; and DB, DR, radii of the parallel, drawn in the ſame planes. Join ER.

Then the arc CQ =the difference of longitude; the arc BR =

=the diſtance between the meridians, meaſured on a parallel of latitude : : EQ = Radius : DR = the coſine of the angle REQ, which is meaſured by RQ, or the latitude.

For the angle QEC is equal to the angle RDB, becauſe the lines RD, BD, are reſpectively parallel to QE, CQ, (by the def. of parallel of lat.) and if the plane GDBR be conceived to be moved towards the equator, without altering the paralleliſm of theſe lines, the point D will coincide with E, and the radii DR, DB, will fall on the radii EQ, EC.

The arcs CQ, BR, are, therefore, arcs of different circles, which meaſure equal angles, and conſequently are as their radii. Corol. 1. theo. 11. ſect. 2. book 1. That is, CQ : BR : : EQ : DR.

Which was to be proved.

Coroll. 1. And CQ : br : : EQ : dr. Whence, by corol. 1. theo. 4. ſect. 1. book 1. BR : DR : : br : dr. From which, other uſeful proportions may be obtained, by varying the order of the terms.

Coroll. 2. From this theorem is derived the method of conſtructing the line of longitude on Gunter's ſcale. In the quadrant CAB, fig. 81, divide the radius CA into 60 equal parts, and number them from the center outwards. From the points of diviſion 10, 20, 30, &c. draw perpendiculars interſecting or meeting the arc in f, e, d, &c. Join AB, and from A, the meeting of the divided radius with the arc, with the chords of Ab, Ac, Ad, &c. deſcribe arcs cutting the line AB in as many points as there are points of diviſion in AC. Number the diviſions of AB in a reverſed order from A. Then, if a line of chords to the ſame radius be applied from A to B, with its diviſions beginning at A, and any latitude be taken on the line of chords, the oppoſite diviſion of the line AB, thus divided, will ſhew the number of equatorial miles in a degree of longitude meaſured on that parallel of latitude. The line AB is from its uſe called the *Line of Longitude.*

The proof of this readily follows from the theorem. For, ſince the radius CA is in proportion to the coſines C 50, C 40, C 30, &c. as 60 to the numbers with which they are graduated, an equatorial degree, or 60 miles, muſt have the ſame ratios to the degrees of the parallels of whoſe latitudes the lines are the coſines. Now the arcs of theſe latitudes are Ab, Ac, Ad, &c. And A 50, A 40, A 30, &c. on the line AB, are the chords of thoſe arcs. The graduated line of chords is, therefore, neceſſary to ſhew the quantities of thoſe arcs, namely the latitudes, and the line of longitude ſhews the quantity of a degree on each parallel, in 60th parts of an equatorial degree, that is, in miles. Which was to be ſhewn.

Examples in Parallel Sailing.

Example I. Fig. 82.

A ſhip in latitude 44° 12′ N. ſails E. 79 miles. Required her difference of longitude.

Conſtruction.

Make AC = coſine 44° 12′, and AB = radius or ſine 90°. From the center A, deſcribe the arcs CD, BE, paſſing thro' C, B. On the arc CD, from C, ſet off 79 miles as a chord; and through D, its other extremity, draw CD prolonged till it meets the arc BE in E. Join BE, and the right line BE is the difference of longitude.

This conſtruction is a geometrical ſolution of the proportion in the theorem, taken in an inverted order. That is, in the ſimilar triangles ACD, ABE, cos. lat. AC : radius : AB : : departure, or meridian diſtance CD : difference of longitude BE.

Or, it is otherwiſe conſtructed*.

Make an angle CAB of as many degrees and minutes as the latitude. From the angular point A, ſet off AC = 79 miles = the departure or meridional diſtance. From C erect the perpendicular CB, meeting AB in B. AB will be the difference of longitude required.

This conſtruction exhibits the ſame proportion as the foregoing. For, in the right-angled triangle ABC, coſine lat. : radius : : departure AC : diff. long. AB.

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* Each of theſe conſtructions is analogous to a projection of the ſphere, the firſt to the orthographic projection on the plane of the equator, and the latter to the ſame projection on the plane of the meridian. The firſt is moſt generally uſed, but the latter ſeems preferable, becauſe it elucidates the ſolution by the traverſe table.

T 2 Con-

Computation.

Coſine lat.	45° 48′	9.85546
: Radius - - - - - - -		10.
: : Departure	79.	1.89763
: Difference long.	110.	2.04217
	Or, 1° 50′	

Solution by the Line of Longitude.

Oppoſite 44¼=the latitude on the line of chords, ſtands 43 on the line of longitude, which is therefore the number of miles in a degree of longitude in that latitude. Whence 43 : 60 : : 79 : 110 miles, or the difference of longitude.

Solution by the Traverſe Table.

With the co-latitude as a courſe, and the meridional diſtance as departure, find the correſponding diſtance. This diſtance is the difference of longitude. That is, with 46° at the bottom of the page ſeek 79 in the column of departure, and the diſtance 110 is the difference of longitude.

The reaſon of this operation is clear, from conſidering that in the right-angled triangle ABC, the angle B, or the co-latitude, is oppoſed to the departure AC, exactly the ſame as if it were an angle of courſe, and that the difference of longitude AB is the ſide oppoſite the right angle, in like manner as the diſtance in plane ſailing.

EXAMPLE II. Fig. 83.

A ſhip in latitude 46° 5′ N. is bound to Gibraltar, which lies on the ſame parallel, and in 4° 46′ W. longitude. By an eclipſe of the moon, ſhe finds her preſent longitude to be 13° 08′ W. What is her meridional diſtance?

Conſtruction.

The difference of longitude, or difference between 4° 46′ and 13° 08′, is 8° 22′, or 502 miles.

With the radius AB, or ſine 90°, deſcribe the arc BE, on which ſet off BE=502 miles. With the coſine of 46° 5′= AC, deſcribe the arc CD. Join AE, interſecting CD in D. Draw the right line CD, and it will be the meridional diſtance.

Or otherwiſe,

Make an angle CAB, whoſe meaſuring arc is=46° 5′=the latitude. On one of the legs ſet off AB=502=diff. long. and from its outer extremity B, let fall the perpendicular BC. AC will be the meridional diſtance.

Computation.

Radius - - - - - -		10.
: Coſine lat.	43° 55′	9.84112
: : Diff. long.	502	2.70070
: Departure	348	2.54182

Solution by the Line of Longitude.

Oppoſite 46°=the latitude on the line of chords, ſtands 41¾, the number of miles in a degree of longitude in that latitude. Therefore 60 : 41¾ : : 502 : 348½ miles the meridional diſtance or departure.

By the Traverſe Table.

With the co-lat.=44° as a courſe, and half the diff. long. =251 as diſtance, is found 174 departure, which doubled, is =348 the meridional diſtance or departure.

CHAP. V.

OF MIDDLE LATITUDE AND MERCATOR'S SAILING.

Middle latitude ſailing, is a method of finding a ſhip's place on the globe, by applying the principles of parallel ſailing to a courſe made good on an oblique rhumb.

When a ſhip ſails on an oblique rhumb, that is, on a courſe between the meridian and parallel, ſhe alters at the ſame time both her latitude and meridional diſtance. But the departure found by plane ſailing, will not be her meridional diſtance, either at the latitude ſailed from or come to. For, at the greater latitude it will be too great, becauſe the meridians converge towards the poles; and, for a contrary reaſon, it will be too ſmall at the leſſer latitude. Whence it follows, that the departure is the true meridional diſtance, meaſured on a parallel which lies between the two extreme parallels, namely, that ſailed from and that come to. In middle latitude ſailing, the departure is taken for the meridional diſtance meaſured on the parallel of the middle latitude; and, though theſe are not ſtrictly equal, yet the error which ariſes from this method, is of no conſequence in a day's run, excepting in very high latitudes.

The middle latitude is found, by taking half the ſum of the two latitudes, if of the ſame name, or half their difference, if of contrary names, and the queſtions are ſolved by the help of the following proportions.

1.
Coſine middle latitude,
: Radius.
: : Departure.
: Difference of longitude.

This proportion is the inverſe of the theorem of parallel ſailing.

2.
Coſine middle latitude.
: Tangent of courſe.
: : Difference of latitude.
: Difference of longitude.

This proportion is deduced from the foregoing, as is here demonſtrated.

Demonſtration. Coſine middle lat. : radius : : departure : diff. longitude.

Therefore, Coſine mid. lat. × diff. long. = radius × departure by theo. 3. ſect. 1. book 1.

Again, difference of lat. : radius : : departure : tangent of courſe. Ex. 4. page 120.

Therefore difference of lat. × tangent of courſe = radius × departure by theo. 3. ſect. 1. book 1.

Whence coſine mid. lat. × diff. long. = diff. lat. × tang. courſe, by axiom 1.

And coſine mid. lat. : tang. courſe : : diff. lat. : diff. long. by theo. 4. ſect. 1. book 1.

Which was to be proved.

Of

Of MERCATOR's SAILING.

Mercator's ſailing, is a method of finding a ſhip's place on the globe, by the aſſiſtance of Mercator's chart, or equivalent tables.

In the mercator's chart, the Meridians are drawn parallel to each other, as in the plane chart, and therefore the meridional diſtance is every where the ſame. But, in order to compenſate for this error, parallels of latitude which are equidiſtant on the globe, are not ſo on the chart, but are more diſtant the higher their latitudes. Or, in other words, the degrees of the meridian are not all equal, but increaſe in length the more remote they are from the equator. And this is ſo, provided that any very minute part of the artificial meridian bears the ſame proportion to a like part of the parallel of its latitude, as do the like parts of each on the globe itſelf*.

THEOREM I.

Radius is in proportion to the coſine of latitude, as the ſecant of latitude is to radius. Fig. 84.

Demonſtration. Let ED repreſent an arc of latitude. Then AF will be its coſine, and AG its ſecant. The triangles ADF, AGE, are ſimilar, for they are right angled, and have a common angle at A. Corol. 1. theo. 5. ſect. 1. book. 1.

Therefore AD=radius : AF = coſine of lat. : : AG=ſecant of lat. : AE=radius.

Which was to be proved.

THEO-

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* This method of conſtructing a chart of the world, whoſe meridians and parallels are right lines, is hinted at in the writings of Ptolemy. Gerard Mercator firſt publiſhed one of theſe charts in 1556, with the theory of which he did not appear to be acquainted, for the parts of his meridian were not increaſed in the true ratio. In the year 1599, Mr. Edward Wright publiſhed his *Correction of Errors in Navigation*, in which the theory is demonſtrated, and the method of computation, by a table of meridional parts, explained. And Dr. Halley, in the Philoſophical Tranſactions, firſt demonſtrated, that the artificial meridian line is a ſcale of logarithmic tangents of half the co-latitudes, beginning from radius.

THEOREM II.

The diſtance of any parallel of latitude from the equator upon Mercator's chart, is in proportion to the ſum of the ſecants of all the arcs of latitude, beginning from 0, and increaſing arithmetically, by an indefinitely ſmall common difference, till the laſt arc be that of the given latitude.

Demonſtration. Rad. : coſine lat. : : part of the equator : like part of parallel. Theo. chap. 4.

And Rad. : coſine lat. : : part of meridian : like part of parallel, becauſe the meridian and equator on the globe are equal.

Again, rad. : coſine lat. : : ſecant lat. : radius, by the firſt theor. of this chapter.

Therefore ſecant lat. : radius : : part of meridian : like part of parallel.

And on Mercator's chart, ſecant lat. : radius : : part of meridian lying in that latitude, (which part, conſequently, muſt be indefinitely ſmall,) : like part of parallel.

Whence $\frac{\text{ſecant lat.}}{\text{part of Mer.}} = \frac{\text{radius}}{\text{part of parallel}}$ by cor. 1. theo. 4. ſect. 1. book 1. and def. 3. ch. ii. ſect. 1. book 1.

But radius is a conſtant quantity, and ſo likewiſe is the part of the parallel, becauſe all the parallels of latitude are equal on Mercator's chart. Aſſume, therefore, any number of arcs of latitude increaſing arithmetically from 0, by an indefinitely ſmall common difference, and call the parts of the Mercator's meridian, correſponding ſucceſſively with the differences of latitude, by the letters a, b, c, &c. Then,

$$\frac{\text{Secant lat. 1.}}{\text{part of Mer. a.}} = \frac{\text{ſecant lat. 2.}}{\text{part of Mer. b.}} = \frac{\text{ſecant lat. 3.}}{\text{part of Mer. c.}} \text{ \&c.}$$

becauſe they are reſpectively equal to the conſtant quantity $\frac{\text{radius}}{\text{part of parallel.}}$

Whence, ſecant lat. 1 : part of Mer. a : : ſec. lat. 2 : part of Mer. b : : ſec. lat. 3 : part of Mer. c, &c.

And ſecant lat. 1 : part of Mer. a : : ſec. lat 1. + ſec. lat 2. + ſec. lat. 3. &c. : parts of Mer. a + b + c, &c. Theo. 6. ſect. 1. book 1.

Now, the ſum of all the parts of the artificial meridian, regularly taken, will be equal to the diſtance from the equator on Mercator's chart of the parallel of latitude expreſſed by the higheſt ſecant.

Therefore, &c.

Which was to be proved.

Corollary. The nautical meridian may be divided practically, by aſſuming arcs of latitude whoſe common difference is known and determinate. And the graduations will be more accurate the ſmaller the common difference. Thus, if the common difference be taken$=1$ min. it will be ſec. 1 m. : meridional part 1 m. : : ſec. 1 m. + ſec. 2 m. + ſec. 3 m. &c : mer. parts $1+2+3$ m. &c. And $\frac{\text{mer.pt.1m}\times\text{ſec.1m.}+\text{ſec.2m.}+\text{ſec.3m.\&c.}}{\text{ſecant 1 min.}}$ $=$merid. pts. $1+2+3$ m. &c. That is to ſay, the ſum or aggregate of the ſecants of all the arcs, arithmetically increaſing by the difference of 1 min. to any given latitude, being divided by the ſecant of 1 min. will give the length of the nautical meridian to that latitude, in parts equal to the firſt meridional part, namely in equatorial miles, becauſe the firſt meridional part contained between the equator and the latitude of 1 min. does not exceed an equatorial mile by any quantity which need be conſidered in practice. By this method it was that Mr. Wright calculated the table of meridional parts.

Scholium. The line marked Mer. on the Gunter's ſcale, is a nautical meridian, adapted to the ſcale of equal parts, or equatorial degrees, which is underneath it, and marked EP. By the help of theſe lines, and the inſtructions already given (ch. 1. book ii.) concerning the plane chart, it is eaſy to conſtruct a Mercator's chart, whoſe degrees ſhall be of the particular magnitude exhibited on the ſcale. But the moſt convenient method of making a chart, whoſe degrees ſhall be of a required magnitude, is to graduate the equator into equal parts or degrees as required, and from thence, as a ſcale, take the diſtances of the ſeveral parallels of latitude from the equator, which ſet off upon the meridian. Theſe diſtances are found in the table of meridional parts to each latitude, where it is to be noted, that if the equator be graduated into minutes, the meridional parts are to be taken as in the table; but, if it be divided only into degrees, the meridional parts muſt previouſly be reduced into equatorial degrees, by dividing by 60.

THEOREM III.

The proper difference of latitude is to the meridional difference of latitude on Mercator's chart, as the departure is to the difference of longitude.

Demonſtration. Let there be taken an indefinitely ſmall part of an oblique rhumb on the globe, and radius : coſine lat. : : difference of longitude : departure by theo. ch. 4.

And ſecant lat. : radius : : diff. long. depart. Theo. 1.

Or, dep. : rad. : : diff. long. : ſec. lat. cor. 1. the. 4. ſect. 1. b. 1.

Now, any definite part of the rhumb may be conceived to be compoſed of a number of ſuch indefinitely ſmall parts croſſing a like number of parallels of latitude.

Therefore, the ſum of all the departures, or the whole departure anſwering to the definite part of the rhumb : the like multiple of radius : : the ſum of all the differences of long. correſponding with the departures, or the whole difference of longitude made : the aggregate of the ſecants of all the latitudes. Theo. 5. 6. ſect. 1. book 1.

That is to ſay, the departure : difference of long. : : a multiple of radius, anſwering to the number of parallels of latitude croſſed over : the aggregate of all the ſecants of thoſe latitudes.

Again, let the ſame indefinitely ſmall part of the ſame oblique rhumb be taken, and, by theo. 2. ſecant lat. : radius : : indef. ſm. part of Mercator's meridian in that latitude, or the meridional difference of latitude : like part of the parallel, or proper difference of latitude, becauſe the parallels on the chart are equal to the meridians on the globe.

Or proper diff. lat. : radius : : meridional diff. lat. : ſecant of lat. corol. 1. theo. 4. ſect. 1. book 1.

And, if the ſame definite part of the rhumb be taken as before, the number of indefinitely ſmall parts which may be conceived to make the whole difference of latitude, will alſo be equal to the number of parallels croſſed over.

Therefore, by the arguments already uſed, the proper difference of latitude : mer. diff. lat. : : a multiple of radius anſwering to the number of parallels croſſed over : the aggregate of all the ſecants of thoſe latitudes.

But it has been proved, that the departure : diff. long. : : a multiple of radius anſwering to the number of parallels croſſed over : the aggregate of all the ſecants of thoſe latitudes.

Whence, proper diff. lat. : mer. diff. lat. : : depart. : diff. longitude.

Which was to be proved.

Corollary. Hence it follows, that the rhumbs are repreſented on Mercator's chart by right lines. For, if AB (fig. 85.) repreſent the proper difference of latitude, and BC the departure made by running on the rhumb AC. And, if Ab be the meridional difference of latitude, and b c the parallel of latitude come to, in Mercator's chart, the line AC prolonged will cut the parallel in c, and b c will be the difference of longitude. For the triangles ABC, Abc, are ſimilar; being both right angled, and having a common angle at A. (Corol. 1. theo. 5. ſect. 2. book 1.) Whence AB, or the proper diff. lat. : Ab, or the mer. diff. lat. : : BC, or the departure : b c, or the difference of longitude, which agrees with the theorem. And in like manner every departure whatſoever, which can be made by ſailing on the rhumb AC, will have the correſponding difference of longitude terminated in the ſame right line continued. It is, therefore, eaſily inferred, that lines on Mercator's chart, which croſs the meridians at the ſame latitudes as the rhumbs do the meridians on the globe, are right lines. That is to ſay, the rhumbs are repreſented on Mercator's chart by right lines. Which was to be ſhewn.

THEOREM IV.

The meridional difference of latitude is to the difference of longitude as radius to the tangent of the courſe.

Demonſtration. For proper diff. lat. : mer. diff. lat. : : depar. : diff. long. Theo. 3.

Or, proper diff. lat. : departure : : mer. diff. lat. : : diff. long. Corol. 1. theo. 4. ſect. 1. book 4.

Now, proper diff. lat. : departure : : radius : tangent courſe. Ex. 4. ch. 1.

Therefore, mer. diff. lat : diff. longitude : : radius : tangent courſe.

Which was to be proved.

Here follows a ſet of examples.

EXAMPLE I. Fig. 86.

It is required to find the courſe and diſtance from the Land's End to the Iſland of Bermudas?

Solution by Middle Latitude Sailing.

Land's End is in lat. 50° 06′ N. and long. 6° 00′ W.
Bermudas lat. 31° 20′ N. long. 64° 48′ W.

Diff. lat. 19.46 or 1186 m. S. D. lo. 58.48 or 3528 m. W

Sum 81.26

½ Sum. 40.43 is middle lat.

49.17 co-middle lat.

Conſtruction.

Make an angle CAE of as many degrees and minutes as the middle latitude, viz. 40° 43′. From the angular point A, ſet off AE=3528 m.=the diff. of longitude, and from its outer extremity E, let fall the perpendicular EC. AC will be the departure or meridional diſtance.

From C, upon CE, prolonged if neceſſary, ſet off CD =1186 miles=the difference of latitude, and join AD.

The angle ADC, which is oppoſite the departure, will be the courſe, and AD will be the diſtance required.

The triangle AEC is conſtructed upon the principles of parallel ſailing, already explained in chap. 4. and the triangle ADC is conſtructed upon the principles of plane ſailing, difference of latitude and departure being given to find the reſt.

It is obvious, that the other method of conſtructing queſtions in parallel ſailing, may be applied inſtead of that which is here uſed; but it is preſumed to be unneceſſary to enter into a detail on that head.

Computation.

To find the departure by inverting the firſt proportion in the preſent chapter.			To find the courſe by the ſecond proportion.		
Radius - - - -		10.	Diff. lat.	1186	ar. co. 6.92592
: Cos. mid. lat.	49° 17′	9.87964	: Diff. lon.	3528	3.54753
: : Diff. long.	3528	3.54753	: : S. co-m. lat.	49° 17′	9.87964
: Departure	2674	3.42717	: Tan. courſe	66° 5′	10.35309

To find the diſtance by plane ſailing.

Sine Courſe	66° 05′	9.96101
: Departure	2674	3·42717
: : Radius - - - -		10.
: Diſtance	2925	3·46616

By the Traverſe Table.

With the co-middle lat. as courſe, and difference of longitude as diſtance, find the correſponding departure, which will be the true departure. In the preſent example, the numbers being ſo high, a proportional part of each muſt be taken, ſuppoſe $\frac{1}{12}$; that is to ſay, with the co-middle lat. 49°, and $\frac{1}{12}$ of 3528=294 as diſtance, the departure is found 221.9. And with this departure, and $\frac{1}{12}$ of 1186 the diff. of lat. viz. 98.9, the courſe 66°, and diſtance 243, are found; which diſtance being multiplied by 12 gives 2916 for the true diſtance.

It may be obſerved, that the remainders which are loſt in dividing large numbers, renders the ſolution by the traverſe table leſs accurate in ſuch caſes as require that operation.

Solution by Mercator's Sailing.

Land's End is in lat.	50° 06′ N.	Meridional parts	3484
Bermudas lat.	31. 20 N.	Mer. parts	1981
		Mer. diff. lat.	1503

Conſtruction. Fig. 87.

Make BE=3528 the difference of longitude, and erect the perpendicular ED=1503 the mer. diff. lat. Join BD. From D ſet off DC=1186, the proper diff. lat.; and through C, draw CA parallel to EB, and cutting DB in A.

The angle ADC will be the courſe, the line AD the diſtance, and AC the departure.

Becauſe the rhumb upon which any given difference of latitude and longitude is made, is upon Mercator's chart a right line, (corol. to theo. 3. of this chapter,) paſſing through the extremes of the lines meaſuring thoſe differences, DB will be the rhumb, and the angle D the courſe. In the triangle DAC, therefore, in which DC is the proper difference of latitude, there is given courſe and difference of latitude to find the reſt, as in Ex. 3. ch. 1. of this book.

Computation.

To find the courſe by theo. 4 of the preſent chapter.			To find the diſtance by plane ſailing.		
Mer. diff. lat.	1503	3.17696	Coſine courſe	23° 05′	9.59336
: Diff. long.	3528	3.54753	: Diff. lat.	1186	3.07408
: : Radius	- - - -	10.	: : Radius	- - -	10.
: Tan. courſe	66° 55′	10.37057	: Diſtance	3025	3.48072

Solution by the Traverſe Table.

With the meridional difference of latitude, or a proportional part of the ſame, as difference of latitude; and the difference of longitude, or a like part, as departure; ſeek, in the traverſe table, for the correſpondent courſe.

And, under the ſame courſe with the proper difference of latitude, will be found the true diſtance and departure.

From the differing reſults of theſe two methods, it appears, that middle latitude ſailing is totally improper to be applied when the latitudes differ conſiderably.

EXAMPLE II.

A ſhip in latitude 47° 23′ N. and longitude 10° 17′ W. ſails SW*b*W. 126 miles. Her preſent latitude and longitude are required?

Solution by Middle Latitude Sailing. Fig. 88.

Conſtruction.

Draw the meridian NS, and from D draw the line DA = 126 miles, the diſtance in the SW. quarter, making an angle with NS equal to the courſe or 56° 15′. From A let fall the perpendicular AC upon the meridian NS.

DC will be the difference of latitude, and AC the departure.

With the difference of latitude thus found, and the latitude ſailed from, find the preſent latitude, and thence the middle latitude.

From A draw AE, making the angle CAE = the middle latitude, and interſecting NS in E. The ſaid line AE will be the difference of longitude.

Computation.

To find the difference of latitude by plane ſailing.	
Radius - - - -	10.
: Diſtance 126 m.	2.10037
:: Co. ſi. courſe 33° 45′	9.74474
: Diff. lat. 70	1.84511
Or, 1° 10′	
To find the diff. longitude.	
Co. mid. lat. 43° 12′ ar. co.	0.16459
: Tang. co. 56° 15′	10.17511
:: Diff. lat. 70.	1.84511
: Diff. long. 153.	2.18481
Or, 2° 33′	

Lat. ſailed from	47° 23′ N.
Diff. lat.	1. 10. S.
Preſent lat.	46. 13. N.
Sum of lat.	93. 36.
Half or mid lat.	46. 48. N.
Co-mid. lat.	43. 12.
Long. ſailed from	10° 17′ W.
Diff. longitude	2. 33. W.
Preſent long.	12. 50. W.

By the Traverſe Table.

With courſe 5 points, and diſtance 126, are found diff. lat. 70, and departure 104.8. And with co-middle lat. 43° as courſe, and departure 104.8, is found diſtance 153, which is the difference of longitude.

Solution by Mercator's Sailing. Fig. 89.

Conſtruction.

Conſtruct the triangle DAC as before, and find the preſent latitude. From the two latitudes and their correſpondent meridional parts, find the meridional difference of latitude, which ſet off from D ſouthward to E. Draw EB to the weſtward of E and parallel to CA. Continue DA till it interſects EB in B.

EB will be the difference of longitude.

Computation.

The preſent latitude is found by plane ſailing, as has already been done.

Lat. ſailed from	47° 23′ N.	Mer. pts.	3237
Lat. come to	46. 13. N.	Mer. pts.	3134
		Mer. diff. lat.	103

To find diff. longitude by Theo. 4. of the preſent chapter.

Radius - - - - - - - -		10.
: Tangent courſe	56° 15′	10.17511
:: Mer. diff. lat.	103	2.01284
Diff. long.	154	2.18795

By the Traverſe Table.

Find proper diff. lat. and departure as before, and under the ſame courſe with mer. diff. lat. inſtead of difference of latitude find the correſpondent departure, which will be the difference of longitude. That is with the courſe 5 points againſt 103 as difference of latitude, is found 154 departure, which is the difference of longitude.

EXAMPLE III.

A ſhip in ſight of the Pic of Teneriffe bearing NNE. finds her latitude by obſervation 26° 45′ N. The ſhip's longitude is required to be found?

Solution by Middle Latitude Sailing. Fig. 90.

Teneriffe lat.	28. 25. N.	Longitude 16° 25′ W.
Ship's lat.	27. 05. N.	
Diff. lat.	1. 20.	or 80 miles S. from the land.
Sum lats.	55. 30.	
Mid. lat.	27. 45.	
Co-mid. lat.	62. 15.	

Conſtruction.

Draw the meridian NS, and from a point in the ſame D draw DA, NNE. Make DC to the northward =80 miles the diff. lat. and draw the parallel of latitude CA. From A draw AE, making the angle CAE = the middle latitude and interſecting NS in E. AE will be the difference of longitude.

Computation.

To find the departure by plane ſailing.		To find the difference of longitude.	
Coſi. co. 67° 30′ ar. co.	0.03438	Coſi. mid. lat. 62° 15′	9.94693
: Diff. lat. 80 m.	1.90309	: Radius - - - -	10.
: : Si. co. 22° 30′	9.58284	: : Departure 33.	1.52031
: Depart. 33.	1.52031	: Diff. long. 37.5	1.57338

Long. Teneriffe	16° 25′	W.
Diff. Long.	.37	W. from Teneriffe
Ship's Long.	17.02	W.

By the Traverſe Table.

With the courſe 2 points and diff. lat. 80 m. is found departure 33 miles, and with the co-middle lat. 62° as courſe, and the ſame departure, is found diſtance 37, which is the difference of longitude.

Solution by Mercator's Sailing. Fig. 91.

Lat. Teneriffe	28° 25′ N.	Mer. parts	1780
Ship's lat.	27.05 N.	Mer. parts	1689
		Mer. diff. lat.	.91

Conſtruction.

Conſtruct the triangle DAC as before. From D ſet off DE=91 the mer. diff. lat. Draw EB to the eaſtward of E, and parallel to C A. Continue DA till it interſects EB in B. EB will be the diff. of longitude.

Computation.

To find the longitude.

Radius - - - - - - - -		10.
: Tan. courſe	22° 30′	9.61722
: : Mer. diff. lat.	91.	1.95904
: Diff. long.	37.7	1.57626

By the Traverſe Table.

With courſe 2 points and mer. diff. lat.=91 inſtead of proper diff. lat. the departure=37.9 is found, which is the difference of longitude.

EXAMPLE IV.

A ſhip, after taking her departure from Cape Clear, ſails SSW. and finds by obſervation of a lunar eclipſe, that her longitude is 10° 54′ W. What diſtance has ſhe ſailed, and alſo what is her preſent latitude?

This queſtion does not admit of a direct ſolution by middle latitude ſailing.

Solution by Mercator's Sailing. Fig. 92.

Cape Clear lat. 51° 12′ N.	Long.	9° 45′	W.
	Ship's lo.	10. 54	W.
	Diff. lo.	1. 09 or 69 m.	W.

Conſtruction.

Draw the Meridian NS, and from a point D in the ſame, draw DB, SSW. From the ſame point D draw Db, W.=69 m. the difference of longitude. Parallel to DS draw bB interſecting DB in B, and parallel to bD draw BE interſecting DS in E. DE will be the meridional difference of latitude.

Subtract the number of miles in the meridional difference of latitude from the meridional parts correſponding with 51° 12′ the latitude ſailed from; the remainder will be the mer. parts correſponding with the latitude come to. Whence both latitudes being known, the proper difference of latitude may be found.

Set off the proper difference of latitude from D to C, and draw the parallel CA interſecting DB in A. CA will be the departure, and DA the diſtance.

Computation.

To find the meridional difference of latitude by inverting the proportion in theorem 4.

Tangent courſe	22° 30′	9.61722
Radius - - - - - - - -		10.
Diff. longitude	69 m.	1.83885
Mer. diff. lat.	166.6	2.22163

Cape Clear lat.	51° 12′ N.	Mer. parts	3588
Subtract mer. diff. lat.			167
Preſent latitude	49.25	Mer. parts	3421
Proper diff. lat.	1.47 or 107 m.		

To find the diſtance.

Coſine courſe	67° 30′	9.96561
: Prop. diff. lat.	107	2.02938
: : Radius - - - - - - -		10.
: Diſtance	115.8	2.06377

By the Traverſe Table.

With the courſe 22° 30′ or 2 points, and diff. long. 69 as departure, is found the difference of latitude 167, which is the meridional difference of latitude. From hence find the proper difference of lat. as has already been ſhewn; and under the ſame courſe and againſt the proper difference of lat. the diſtance 116. will be found.

EXAMPLE V. Fig. 93.

A ſhip in latitude 38° 10′ N. ſails 80 miles on a ſoutherly courſe, and makes 54 miles eaſting. What courſe has ſhe ſteered, and what difference of latitude and longitude has ſhe made?

Solution by Middle Latitude Sailing.

Conſtruction.

Draw the meridian NS, and from a point C in the ſame, draw the parallel of latitude CA to the eaſtward = 54 miles the eaſting. From A, with the diſtance 80 miles, deſcribe an arc cutting NS in D to the northward of C, and join DA.

The angle CDA will be the courſe, the line DA the diſtance, and DC the ſouthing or difference of latitude. Whence the preſent latitude, and conſequently the middle latitude may be found.

From A draw AE, making the angle CAE = the middle latitude, and interſecting NS in E. The line AE will be the difference of longitude.

Computation.

To find the courſe by plane ſailing.

Diſtance	80	1.90309
: Radius - - - -		10.
: : Departure	54	1.73239
: Sine courſe	42° 27′	9.82930
Its comp.	47.33	

To find the diff. long.

Coſi. mid. lat.	52° 20′	9.89849
: Departure	54	1.73239
: : Radius - -		10.
: Diff. long.	68.2	1.83390
	Or 1° 08′ E.	

To find the difference of latitude by plane ſailing.

Radius - - - -		10.
: Diſtance	80	1.90309
: : Coſi. courſe	47° 33′	9.86798
: Diff. lat.	59	1.77107
Lat. from	38.10 N.	
Preſent lat.	37.11 N.	
Sum	75.21	
Mid. lat.	37.40	
Co-mid. lat.	52.20	

By the Traverſe Table.

With diſtance 80 and departure 53.5 (the neareſt in the table to 54) are found courſe 42°, and diff. of lat. 59.4. And with co-middle latitude 52° as courſe, and departure 53.6, is found diſtance 68, which is the difference of longitude.

Solution by Mercator's Sailing. Fig. 94.

Conſtruction.

Conſtruct the triangle DAC as before, and find the preſent latitude. From the two latitudes and their correſpondent meridional parts, find the meridional difference of latitude, which ſet off from D ſouthward to E. Draw EB to the eaſtward, and parallel to C A. Continue DA till it interſects EB in B.

EB will be the difference of longitude.

Computation.

The preſent latitude and courſe are found by plane ſailing, as has already been done.

Lat. ſailed from	38° 10′ N.	Mer. parts	2481
Lat. come to	37.11 N.	Mer. parts	2406
		Mer. diff. lat.	75

To find the difference of longitude.

Proper diff. lat.	59.	ar. co.	8.22893
: Mer. diff. lat.	75.		1.87506
: : Departure	54.		1.73239
: Diff. long.	68.6		1.83638

By the Traverſe Table.

With diſtance 80, and departure 53.5, are found courſe 42° and diff. lat. 59.4. And under the ſame courſe with mer. diff. lat. 75 inſtead of proper diff. lat. is found departure 68.6 or difference of longitude.

EXAMPLE VI. Fig. 95.

A ſhip in lat. 29°. 40′. S. ſails 250 miles in the NW. quarter, and then finds her latitude by obſervation 26.13 S. Her courſe, departure, and difference of longitude, are required to be found ?

Solution by Middle Latitude Sailing.

Lat. ſailed from	29° 40′	S.
Lat. come to	26. 13	S.
Sum	55. 53	
Middle lat.	27. 56	
Co-mid. lat.	62. 04	
Diff. lat.	3. 27 or 207 miles northing.	

Conſtruction.

Draw the meridian NS, and from a point D in the ſame, ſet off to the northward DC=207 miles the difference of latitude. From C the latitude come to, draw the parallel of latitude CA, unlimited towards A weſtward. From D, with the diſtance 250 m̃. deſcribe an arc cutting CA in A, and join DA.

From A draw the line AE, making the angle CAE=27° 56′ the middle latitude, and interſecting NS in E.

The angle ADN will be the courſe, the line AC the departure, and the line AE the difference of longitude.

Computation.

To find the courſe by plane ſailing.

Diſtance	250	2.39794
: Radius - - - -		10.
: : Dif. lat.	207	2.31597
: Coſi. courſe	55° 54′	9.91803
Its comp.	34.06 or the angle of courſe.	

To find the departure by plane ſailing.

Radius - - - -		10.
: Diſtance	250.	2.39794
: : Sine courſe	34° 06′	9.74868
: Departure	140	2.14662

To find the difference of longitude.

Coſine mid. lat.	62.04	9.94620
: Radius - - - - - - -		10.
: : Departure	140.	2.14662
: Diff. long.	158.6	2.20042

By The Traverſe Table.

With the diſtance 250, and neareſt diff. lat 207.3, is found courſe 34°, and departure 139.8. And with the co-mid. lat. 62° as courſe, and departure 139.5, is found diſtance 158, which is the difference of longitude.

Solution by Mercator's Sailing. Fig. 96.

Conſtruction.

Conſtruct the triangle DAC as before. Find the mer. diff. lat. and ſet it off northward from D to E. Draw EB to the weſtward of E, and parallel to CA. Continue DA till it interſects EB in B.

EB will be the difference of longitude.

Computation.

The courſe and departure are found by plane ſailing as before.

Lat. ſailed from	29° 40′	S.	Mer. parts 1865
Lat. come to	26.13	S.	Mer. parts 1631
			Mer. diff. lat. 234

To find the diff. long.

Radius	- - - - -	10.
: Tang. courſe	34° 06′	9.83062
: : Mer. diff. lat.	234	2.36921
: Diff. lat.	158.4	2.19983

By the Traverſe Table.

Courſe and departure being found as before, the mer. diff. lat. 234 taken as diff. lat. under the ſame courſe, gives departure or difference of long. 158.3.

EXAMPLE VII.

From a port in lat. 53° 07′ N. a ſhip ſails ESE till her departure becomes 112 miles. It is required to determine the diſtance ſailed and difference of longitude made.

Solution by Middle Latitude Sailing. Fig. 97.

Conſtruction.

Draw the meridian NS, and from a point D in the ſame, draw DA on a SSE. courſe. Draw the parallel of latitude Da to the eaſtward=112 miles the departure. Draw likewiſe the line aA parallel to NS, and interſecting DA in A. Through A draw the parallel AC interſecting NS in C. DC will be the difference of latitude, and DA the diſtance.

Find the latitude come to, and thence the middle latitude.

From A draw the line AE, making the angle CAE=the middle latitude, and the ſaid line will be the difference of longitude.

Computation.

To find the diſtance by plane ſailing.

Sine courſe	67° 30′	9.96561
: Departure	112	2.04922
: : Radius - - - -		10.
: Diſtance	121.2	2.08361

Lat. ſailed from	53° 07′	N.
Diff. lat.	46	S.
Lat. come to	52.21	N.
Sum	105.28	
Mid. lat.	52.44	
Co-mid. lat.	37.16	

To find the difference of latitude by plane ſailing.

Radius - - - -		10.
: Diſtance	121.2	2.08361
: : Coſi. courſe	22° 30′	9.58284
: Diff. lat.	46.4	1.66645

To find the difference of longitude.

Coſi.m.lat.	37°17′	ar.co.0.21770
: Tan. co.	67° 30′	10.38277
: : Diff. lat.	46.4	1.66645
: Diff. long.	184.9	2.26692

By the Traverſe Table.

With courſe 6 points, and diſtance 112 miles, is found diff. of latitude 46.3, and diſtance 121. And with co-mid. lat. 37° as courſe, and the ſame departure, is found 186=Difference of longitude in the column of diſtance.

Solution by Mercator's Sailing, Fig. 98.

Conſtruct the triangle DAC as before, and find the preſent latitude. From the two latitudes and their correſpondent meridional parts, find the meridional difference of latitude, which ſet off to the ſouthward from D to E. Draw EB to the eaſtward from E, and parallel to CA. Continue DA till it interſects EB in B.

EB will be the difference of longitude.

Computation.

The diſtance and difference of latitude are found by plane ſailing as has already been done, and thence the two latitudes.

Lat. ſailed from	53° 07′	N.	Mer. parts	3775
Lat. come to	52.21	N.	Mer. parts	3699
			Mer. diff. lat.	76

To

To find the Difference of Longitude.

Proper diff. lat.	46.4	ar. co.	8.33355
: Mer. diff. lat.	76.		1.88081
: : Departure	112.		2.04922
: Diff. long.	183.5		2.26358

By the Traverſe Table.

The difference of latitude and diſtance being found as before under the courſe 6 parts, the difference of longitude 183.9 is found in the departure column under the ſame courſe againſt 76 the mer. difference of latitude, taken as difference of latitude.

EXAMPLE VIII.

A ſhip in 36° 20′ ſouth latitude by obſervation, meets another ſhip who had made 210 miles eaſting or departure from Cape Lagulhas. What is her preſent longitude, and alſo the bearing and diſtance of the Cape?

Solution by Middle Latitude Sailing. Fig. 99.

Cape Lagulhas lat.	34° 44′ S.	Long. 20° 32′ E.
Ship's latitude	36. 20	
Difference of lat.	1. 36	or 96 miles N. from the ſhip.
Sum of lat.	71. 04.	
Middle lat.	35. 32	
Co-mid. lat.	54. 28.	

Conſtruction.

Draw the meridian NS, and from a point in the ſame D ſet off 96 miles to the northward to C. From C draw the parallel C A to the weſtward = 210 miles the departure. Join DA.

From A draw AE, making the angle CAE=35° 32′ the middle latitude, and interſecting NS in E.

The line AE will be the difference of longitude, the angle CDA the courſe or bearing of the Cape, and the line DA the diſtance.

Computation.

To find the courſe or bearing by plane ſailing.

Diff. lat.	96	1.98227
: Radius - - - -		10.
: : Depart.	210	2.32222
: Tang. cou.	65° 26′	10.33995

To find the difference of longitude.

Co-ſi. mid. lat.	54° 28′	9.91050
: Radius - - - -		10.
: : Departure	210	2.32222
: Diff. long.	258.1	2.41172
	Or, 4° 18′	

To find the diſtance by plane ſailing.

Sine co.	65° 26′	9.95879
: Depart.	210	2.32222
: : Radius - - -		10.
: Diſtance	230.9	2.36343.

Long. Cape Lagulhas	20°32′E.
Diff. long. E. fr. the Cape	4.18
Ship's longitude	24.50 E.

By the Traverſe Table.

Seek difference of lat. 96, and departure 210, in the table; the neareſt found are 97.6 and 209.4, which correſpond with 65° courſe, and 231 diſtance. Again, with co-middle lat. 54° as courſe, and 210 departure, is found 260 difference of longitude in the column of diſtance.

Solution by Mercator's Sailing. Fig. 100.

Conſtruction.

Conſtruct the triangle DAC as before, ſet off the mer. diff. lat. to the northward from D to E. Draw EB to the weſtward from E, and parallel to CA. Continue DA till it interſects EB in B.

EB will be the difference of longitude.

Com-

Computation.

The bearing and diſtance is found by plane ſailing as before.

Cape Lagulhas, lat.	34° 44′ S.	Mer. parts.	2225
Ships lat.	36. 20 S.	Mer. parts.	2343
		Mer. diff. lat.	118

To find the Difference of Longitude.

Proper diff. lat.	96	ar. co.	8.01773
: Mer. diff. lat.	118		2.07188
: : Departure	210		2.32222
: Diff. long.	258.1		2.41183

By the Traverſe Table.

The bearing and diſtance being found, as already ſhewn; under the ſame courſe with 118 as difference of latitude, is found departure or difference of longitude 254. The difference in theſe reſults is owing to the odd minutes in the courſe being rejected.

CHAP. VI.

OF THE METHOD OF KEEPING A JOURNAL, OR WORKING DAY's WORKS AT SEA.

A SEA Journal is a regiſter of events which happen at ſea, of obſervations by which the ſhip's place is determined, and of the reſult of the calculations made from thoſe obſervations.

The computation of a ſhip's place from the traverſe made in 24 hours is called a Day's work.

The journal kept when a ſhip is in port is called Harbour work. In this part of the journal, the day is eſtimated by the civil reckoning, or from midnight to midnight as on ſhore. It contains nothing more than an account of the work done on board, and other incidental events, in the relation of which, no ſcientific knowledge is required.

The regiſter of the courſes, diſtances, winds, &c. from which the daily computation of a ſhip's place at ſea is made, is called by mariners the Log. The board on which it is firſt written with chalk is called the Log-Board; the book in which it is entered for the uſe of thoſe on board who chuſe to copy it, is called the Ship's Log-Book; and the account for one day is called the Day's Log.

The computations made from the log are called the Dead Reckoning or Account.

For the advantage of comparing the latitude by dead-reckoning with the latitude by meridional obſervation, it has been found convenient to end the log of the day at noon. So that the inſtant of noon ends the day with navigators, is the middle point of the day according to the civil reckoning, and is the beginning of the day with aſtronomers, as has been before remarked.

In the Royal Navy, and on board ſhips which belong to the Eaſt India Company, the log is hove every hour, but in moſt other ſhips it is hove every two hours. This laſt circumſtance makes no difference in the computations, excepting that the diſtance run on every courſe, or rate of velocity entered in the log-book, muſt be doubled, in working the day's work.

The day's work conſiſts in finding from the traverſe run in the 24 hours, the courſe, diſtance, difference of latitude, and departure made good, from which the difference of longitude is obtained, either by Mercator's or middle latitude ſailing. The former part of this work contains all the information neceſſary to enable the mariner to do this; but, for the ſake of ſuch as have not leiſure to acquire this knowledge otherwiſe than by rote, we ſhall give a ſet of precepts more at large. Previous to this, it will be proper to mention the allowances or corrections which are made on account of lee-way, and ſuppoſed currents.

When the wind blows ſideways upon a ſhip under ſail, that part of the wind which ſtrikes her hull and rigging, together with a conſiderable part of the force which is exerted on the ſails, tends to drive her immediately from the wind or to leeward. But her velocity in the direction of her ſtem is, in moſt caſes, much greater than her velocity in the direction of her broadſide. Her real courſe is between the two directions, and the angle formed between the line of her apparent courſe, and the line ſhe really deſcribes through the water, is termed rather improperly her lee-way. It is not uſual at ſea to regard the lee-way, except when cloſe hawled, or as near the wind as the ſhip will lie. In this caſe it is much the greateſt, though it may be worth attention in other caſes. There are many circumſtances which prevent the laying down rules for the allowance in theſe reſpects. The conſtruction of different veſſels, their trim with regard to the nature and quantity of their cargo and the poſition and magnitude of the ſails ſet, together with the ſwell of the ſea are all ſuſceptible of great variation, and very much affect the lee-way. The following rules are uſually laid down by writers.

1. A ſhip is ſuppoſed to make no lee-way when ſhe is going large, or when cloſe hawled in ſmooth water, with a light breeze and all ſails ſet.
2. Allow one point when the top-gallant-ſails are handed.
3. Allow two points when under cloſe reefed topſails, &c.
4. Allow two points and a half when one topſail is handed.
5. Allow three points and a half when both topſails are handed.
6. Allow four points when the fore courſe is handed.
7. Allow five points when under main-ſail only.
8. Allow ſix points when under balanced mizen.
9. Allow ſeven points when under bare poles.

Theſe allowances may be of ſome uſe to work up the day's works of a Journal which has been neglected; but a prudent navigator will never be guilty of this neglect. The only accurate practical method of eſtimating the lee-way, is to obſerve the bearing of the ſhip's wake as frequently as may be judged neceſſary, which may be conveniently enough done by drawing a ſmall ſemi-circle on the taffarel, with its diameter at right angles to the ſhip's length, and dividing its circumference into points, &c. The angle contained between the ſemi-diameter which points right aft, and that which points in the direction of the fartheſt viſible part of the wake, is the lee-way. Thoſe who accuſtom themſelves to eſtimate parts of the horizon, will be able to gueſs the bearing of the wake within half a point, without any aſſiſtance.

But the beſt and moſt rational way of bringing the lee-way into the day's log, is to have a compaſs or ſemi-circle on the taffarel, as before deſcribed, with a low crutch or ſwivel in its center. After heaving the log, the line may be ſlipped into the crutch juſt before it is drawn in, and the angle it makes on the limb, with the line drawn right aft, will ſhew the lee-way very accurately, which, as a neceſſary element, ought to be entered in a ſeparate column againſt the hourly diſtance on the log-board.

If there were any method to meaſure the velocity and direction of thoſe currents which occaſionally prevent the latitude by account from agreeing with the latitude by obſervation, and are probably the chief reaſon of the inaccuracy of the dead-reckoning, it would be highly proper to bring this velocity and direction into the day's work. But there is no ſuch method, and ſtrong reaſons may be urged againſt the poſſibility of any method being invented for this purpoſe. However, the following is ſometimes uſed.

In calm weather, a ſmall boat is hoiſted out, and is provided with a coil of rope, an iron pot, a log-line and log, and a half-minute glaſs. With this apparatus the obſervers row to ſome diſtance from the ſhip, and faſtening the rope to the pot, let it down into the ſea as far as the rope will allow. The boat, in theſe circumſtances, generally ſwings round, and rides as if at anchor. The log is then hove, and the quantity it indicates, is taken as the hourly velocity of the current.

This method deſerves very little eſtimation. For it can only be uſed in a calm. There is no proof by which it can be determined, whether an under current moves the pot and makes the boat paſs through the water, or whether the water at the ſurface is moved, or both. Suppoſing a current at the ſurface, it is evident that the boat, preſenting a much larger ſurface of reſiſtance than the pot, muſt be carried along, though not ſo ſwiftly, as if the pot were not let down; therefore the log cannot ſhew the velocity. If this experiment be repeated after an interval of ſome hours, it ſeldom agrees with the former, &c. &c.

Here it is to be remarked, that we are ſpeaking of currents which are ſuppoſed to exiſt at a conſiderable diſtance out at ſea: For the direction and velocity of tides, &c. near the ſhore, may be well aſcertained from obſervations made while at anchor, and it is very expedient to conſider them in domeſtic pilotage. But the reckoning of a ſhip in theſe circumſtances is very different from her reckoning out at ſea. In coaſting navigation no great attention is paid to the courſe and diſtance run, becauſe the ſhip's place may be more readily determined from the ſoundings and the bearings, and diſtance of the remarkable parts of the land: whereas in remote voyages the courſes and diſtances run, are the chief data from which her place is known.

There is an allowance or correction of the reckoning, which moſt writers direct to be made on the ſuppoſition of errors, either in the courſe or diſtance found by the log. Thus, if the latitude by account differs much from the latitude by obſervation, and the courſe be near the meridian, they direct the journaliſt to alter the diſtance and retain the courſe; if the courſe be near the parallel, the courſe is to be altered, and not the diſtance; and if the courſe be near four points, both courſe and diſtance are to be altered. Theſe corrections are at beſt no better than conjectures without foundation; for neither the ſteerage nor the heaving of the log are ſo irregularly managed on ſhipboard, as to correſpond with the obſervation on ſome days, and differ evidently from it on others. But this method has never been generally received among navigators.

It is manifeſtly productive of confuſion and inconvenience to make any allowance or correction of the dead-reckoning which cannot be clearly aſcertained. For this reaſon the correction juſt mentioned, and the corrections on account of ſuppoſed currents, ought to be abſolutely rejected. The dead-reckoning which is accurately kept without theſe corrections, may differ from the ſhip's true place at the end of the voyage; but this difference is a valuable acquiſition to the navigator, becauſe he knows it to be the quantity by which the ſhip has been accelerated or retarded in her paſſage by unknown cauſes, and may reaſonably expect to find a like difference in running again over the ſame track: whereas the dead-reckoning which has been corrected by allowing for ſuppoſed currents and imaginary errors in the courſe and diſtance run, is little, if at all, more likely to produce a good landfall, than that in which theſe allowances are not made; and the difference between the true ſituation of the ſhip at the end of the voyage, and that ſhewn by account, is of no uſe, becauſe it is not known whether it ariſes from external cauſes, or from the allowance made. However, it may perhaps be uſeful to keep a ſeparate account of the quantity and direction in which errors are occaſionally ſuppoſed to affect the longitude.

CHAP. VII.

PRECEPTS FOR KEEPING A JOURNAL AT SEA.

1. MAKE a traverſe table of ſix columns, and title them, courſe, diſtance, northing, ſouthing, eaſting, weſting.

2. Enter every different courſe as it ſtands in the log, if the ſhip has been going large, but if ſhe has been cloſe hawled, allow the proper quantity of lee-way on each courſe before it is entered. Againſt each courſe place the whole diſtance run on that courſe, without regarding whether it has been run all at once, or at diſtant intervals of time.

3. With each courſe and diſtance, find the difference of latitude and departure, which place in the columns of northing or ſouthing, eaſting or weſting, according to the quarter in which the courſe is made.

4. Add up the columns of difference of latitude and departure. Find the difference between the total northing and total ſouthing, which will be difference of latitude of the ſame name as the greater quantity. Find alſo the difference between the total eaſting and total weſting, which will be departure of the ſame name as the greater quantity.

5. With the difference of latitude and departure thus found, ſeek in the table for courſe and diſtance made good, which will be in the quarter of the compaſs contained between the names of the difference of latitude and departure.

6. Correct this courſe by allowing the variation of the compaſs to the right hand of the courſe, if the variation be eaſt, but to the left hand if weſt.

7. With corrected courſe and diſtance made good, ſeek a new difference of latitude and departure, which will be the true difference of latitude and departure, and are to be named from the quarter in which the courſe is made.

8. If the latitude ſailed from be of the ſame name as the difference of latitude, add them together, if not, ſubtract them; the ſum or difference will be the preſent latitude, or latitude by account, of the ſame name with the greater quantity.

9. Take the middle latitude between the latitude ſailed from and the latitude come to. With this middle latitude as a courſe, and the departure as a difference of latitude, find the diſtance, which will be the difference of longitude of the ſame name as the departure.

10. Or otherwiſe to find the difference of longitude. From the table of meridional parts, take the meridional parts for the latitude ſailed from, and for the latitude come to by account, ſubtract them if the latitudes are of like names, but if not add them together, the difference or ſum will be the meridional difference of latitude. With the corrected courſe made good, and the meridional difference of latitude as difference of latitude, find the correſpondent departure, which will be the difference of longitude of the ſame name as the departure.

11. If the longitude ſailed from be of the ſame name as the difference of longitude, add them together, if not, ſubtract them; the ſum or difference will be the preſent longitude, or longitude by account, of the ſame name with the greater quantity. Except only when the longitude thus found exceeds 180°, in which caſe it muſt be taken from 360°, and the remainder is the longitude of the contrary name to what it would otherwiſe have been.

12. To find the bearing and diſtance of the port of deſtination, or of any other place from the ſhip. The latitude and longitude of the ſhip being known, find the latitude and longitude of the place, by means of the table of places. If the latitudes be both of the ſame name, ſubtract them, and alſo their meridional parts; if of different names, add inſtead of ſubtracting. The firſt difference or ſum will be the proper

difference of latitude, and the latter difference or ſum will be the meridional difference of latitude. If the longitudes be both of the ſame name, take their difference; but if of different names, their ſum, which will be the difference of longitude when leſs than 180°, but when more muſt be ſubtracted from 360° to give the difference of longitude. With the meridional difference of latitude, as difference of latitude, and the difference of longitude in minutes, as departure, find the courſe; and with this courſe and the proper difference of latitude, find the diſtance. This courſe is the bearing, and the diſtance is the diſtance of the place as required. Note, If any one or more of the numbers be too large to be found in the table, they muſt all, except the courſe, be diminiſhed, by dividing them by any common number, and the diſtance found being multiplied by the ſame common number, will produce the true diſtance.

In theſe inſtructions, the mariner is directed to keep a daily reckoning of the courſe, diſtance, difference of latitude and departure made good, together with the latitude by account, latitude by obſervation, difference of longitude and longitude in, reckoned from the firſt meridian. Theſe particulars are quite ſufficient for the determination of the ſhip's place. The bearing and diſtance is ſeldom worked, except when the land is ſuppoſed to be near. Some navigators keep longitude made, inſtead of longitude in. Longitude made, is the longitude reckoned from the meridian of the place from which the departure was taken. It is equally accurate, but not quite ſo convenient in practice, as the other. Some likewiſe keep an account of total departure, under the name of meridional diſtance, which is not applicable to any uſe whatſoever.

The precepts, number 9 and 10, contain two different methods of turning departure into difference of longitude. The firſt is rather the eaſieſt in practice, and is more accurate than the other when the courſe is near the eaſt or weſt points of the compaſs; but when the courſe is near the north or ſouth points of the compaſs, the latter method is to be preferred.

The following ſpecimen of a ſea journal will ſufficiently exemplify the foregoing precepts, as it contains almoſt every variety of occurrence which can happen with reſpect to the courſes, winds, &c. and has been compoſed with a few alterations from a journal actually kept at ſea.

It is uſual to write a general title to the journal in one of the firſt blank leaves. This title may be as follows,

A Journal of a Voyage from England towards Liſbon. In the Ship Harmony, of London, George Hamilton, Commander. Kept by Robert Tyrrel, Chief Mate.

The following explanation of ſome of the terms uſed in the journal, will be of uſe to the learner who has never been at ſea.

A.M. P.M. F.T.S. M.S. &c. are the initial letters of abbreviated words, A. M. and P. M. ſignify forenoon and afternoon. The other abreviations which end with the letter S, denote the names of ſails, as fore-topſail, mainſail, &c.

Hawled her wind—cloſe hawled—upon a wind. Theſe terms ſignify, that the ſhip's ſails are arranged in ſuch a manner, that her courſe is as near as poſſible to that point of the compaſs from which the wind blows.

Aft or abaft, is towards the ſtern or hinder part of the ſhip. Towards or afore, is towards the fore part of the ſhip.

Starboard ſignifies on the right hand, and larboard on the left.

Starboard tack—larboard tack. When a ſhip is cloſe hawled, certain ropes called *tacks*, which are faſtened to the lower corners of the main and fore-ſails, are hawled forward on the weather ſide or ſide next the wind, in which caſe thoſe tacks are ſaid to be on board. When the ſhip is cloſe hawled, with the wind on the right hand, ſhe has her ſtarboard tacks on board, and is ſaid to ſail on the ſtarboard tack. But if the wind be on the left hand in the ſame manner, ſhe has her larboard tacks on board, and is ſaid to ſail on the larboard tack.

To tack—to veer or wear. When a ſhip ſailing upon a wind is made ſuddenly to change her courſe, ſo as to become cloſe hawled upon the other tack, ſhe is ſaid to be put about. There are two methods of doing this. When the ſhip's head is moved towards the wind, and paſſes the line of its direction, ſhe is ſaid to tack; but when her head is moved in the contrary direction, till the deſired poſition is obtained, ſhe is ſaid to veer or wear. There are reaſons for preferring either of theſe methods reſpectively, according to circumſtances

Going large. A ſhip is going large when ſhe is not cloſe hawled.

Lay too, or lie too. A ſhip is ſaid to lie too when her ſails are ſo poſited that they counteract each other, by which means ſhe is made to remain nearly in the ſame place. It is likewiſe uſual to ſay a ſhip lays too, or tries, when in a ſevere gale of wind, all her ſails are furled but one or two.

CHAP. VIII.

JOURNAL OF A VOYAGE FROM ENGLAND TO LISBON.

Ship Harmony lying off Ryde.

H.	K.	F.	Courſes.	Winds, &c.	Monoay, February 17, 1772.
1					
2					
3					In the firſt part light airs ſoutherly, middle and latter an increaſing gale, with fine weather throughout.
4					
5					
6					At noon the pilot left us, the Needles point bearing E. half N. diſtant 5 or 6 miles.
7					
8					
9					
10					
11					
12					
1					
2					
3					
4					
5					
6				ESE, fair weather	
7					
8					Weighed and made ſail.
9					
10					
11					
12					Steered through the Needles.

Ship Harmony from England towards Liſbon.

H.	K.	F.	Courſes.	Winds, &c.	Tueſday, February 18, 1772.
1	5	4	SWbW.	E, fair.	
2	6	5	WSW.		A pleaſant gale throughout and fine weather.
3	6	5			
4	6	4	WbS.		1 P. M. Peveral Point bore NW½ N. diſtant 4 leagues.
5	7	2			
6	7	4			
7	8				2 P. M. Portland NW¼W.
8	8				4 do. do. NbE½E. diſt. 6 leagues.
9	8			In 1 reef F. T. S.	
10	8			Cloudy.	
11	7	3	W.		
12	7				I take my departure from the laſt bearing of the Bill of Portland; allowing its ſituation to be
1	6	4			
2	7				
3	7				Lat. 50° 30′ N.
4	7				Long. 2° 48′ W. from the meridian of London.
5	7				
6	6	5		Squally.	
7	6	4		Out reefs.	
8	6	3	W½S.	Cloudy!	Variation of the compaſs 22° weſterly.
9	7		W.	ENE.	
10	7				
11	6				
12	6				
	167				

Courſe.	Dist.	S.	W.	Lat. A.	Lat. O.	Diff. Long.	Long. in.
S. 58° W.	148.	78	125	49° 12′ N.	No.obs.	3° 14′ W.	6° 02′ W.

The Day's Work, Feb. 18. 1772.

TRAVERSE TABLE.

Courſes.	Dist.	N.	S.	E.	W.
SbW½W.	18		17.2		5.2
WbS.	47		9.1		46.1
W.	88.				88.
W½S.	6		0.6		6.
S. 80° W.	148		26.9		145.3

Lat. ſailed from 50° 30′ N. M. P. 3521.4
Diff. lat. made 1. 18 S.

Lat. by ac. 49. 12 N. M. P. 3400.4

Hence diff. long. 193.4 W. or 3° 13′ 121.0
Or by mid. lat. 194 or 3° 14′ W.
Long. ſailed from 2° 48′ W.
Diff. long. 3.14 W.

Longitude in 6.02 W.

22 W. Variation.

S 58 W. correct courſe.

148 diſtance.

78 true ſouthing.

125 true weſting.

As there is no land in ſight to-day at noon, and by our day's run we muſt be clear of the Britiſh Channel, it is not probable we ſhall ſee any other part of the coaſt of England. I therefore take my departure from the laſt bearing and diſtance of Portland. The ſhip at that time was in the ſame ſituation as if ſhe had run from thence on the oppoſite rhumb; for which reaſon S*b*W½W. or the oppoſite direction to N*b*E½E. is entered as the firſt courſe with the diſtance 6 leagues or 18 miles. The other courſes in the traverſe table, are extracted with their diſtances from the log, beginning from 4 P. M. at the end of which hour the bearing was taken. The reſpective differences of latitude and departure are found in table 5. (as directed by precept 3.) The total difference of latitude and departure is obtained by adding up the columns, correſpondent to which, in table 6, is the courſe S. 80 W. diſt. 148. The variation 22° W. is allowed to the left hand of this courſe (according to precept 6.) that is to ſay, the courſe is altered 22° more ſoutherly, which gives S. 58° W. for the corrected courſe. With this corrected courſe, and the diſtance 148 as before, is found 78 true diff. lat. and 125 true departure, (according to precept 7.) Becauſe the lat. ſailed from=50° 30′ N. and the difference of latitude 78 or 1° 18′ S. are of different names, their difference is the latitude by account 49° 12′ N. (precept 8.) The middle latitude in whole degrees is 50°, which taken as a courſe, with the departure 125 as a difference of latitude, gives 194=3° 14′ for the difference of longitude, (precept 9.) Or otherwiſe, ſeek in table 7. the meridional parts to both latitudes, and take the difference=121. then with corrected courſe 58°, and difference of latitude 121, is found 193.4 departure, which is the difference of longitude, (precept 10.) Here it may be noted, that though both methods are here exemplified, yet it is not neceſſary in practice to uſe more than one of them. The diff. long. 3° 14′ W. being added to the longitude ſailed from, 2° 14′ weſt, gives 6° 02′ W. the longitude in. As we are not yet got ſufficiently out at ſea to ſteer a direct courſe to the place of our deſtination, it is uſeleſs to work the bearing and diſtance.

Ship Harmony from England towards Liſbon.

H.	K.	F.	Courſes.	Winds, &c.	Wedneſday, February 19, 1772.
1	5		W*b*S.	NE*b*E. cloudy.	
2	4	5			
3	4	4			
4	4	4		NE.	A pleaſant breeze decreaſing, with fair weather for the moſt part.
5	4				
6	3	4			A. M. Unbent the cables and coiled them down in the tier.
7	2	5			
8	4			N*b*W. Squally.	At noon ſounded and got ground at 82 fathom, large gravel and hags-teeth.
9	2			In 1 reef.	
10	2		WSW.		
11	5				
12	5			NW.	
1	5		W*b*S.	NW*b*N.	
2	5			NNW.	
3	4			N*b*W.	
4	4				
5	3	3		NNW.	
6	3	4			
7	2				
8	2			N*b*W.	
9	1	4			
10	2				Variation 22 degrees weſterly.
11	2	2			
12				Calm.	
	82.				

Courſe.	Diſt.	S.	W.	Lat. A.	Lat. obs.	Diff. Long.	Long. in.
S. 55° W.	82.	47	67	48°25′N	48°19′N.	1° 42′ W.	7° 44′ W.

The Day's Work.

TRAVERSE TABLE.

Courſe.	D.	N.	S.	E.	W.
W*b*S.	70		13.7		68.[illegible]
WSW.	12		4.6		11.[illegible]
S. 77° W.	82		18.3		79.8

22 W. variation.

S. 55 W. corrected courſe

47 true ſouthing.

67 true weſting.

This day's work is in every reſpect ſimilar to that of the foregoing day; and therefore requires no farther explanation than is already given.

Lat. ſailed from 49° 12′ N. M. P. 3400.4
Diff. latitude 47 S.

Lat. by ac. 48.25 N. M. P. 3329.1

Hence diff. long. 103 or 1° 43′ W. 71.3
Or by mid. lat. 102 or 1° 42′ W.
Longitude ſailed from 6° 02′ W.
Difference long. 1.42 W.

Longitude in 7.44 W.

Ship Harmony from England towards Liſbon.

H.	K.	F.	Courſes.	Winds, &c.	Thurſday, February 20, 1772.
1			Head NW.	Calm. Fair.	
2					Light variable winds in the firſt part. with fair weather, middle and latter ſqually with rain.
3					
4					
5					
6	2		W*b*S.	S*b*E.	
7	3	4		S.	
8	4	3			
9	5	4			
10	6				
11	5	5			
12	5	5		In 1 reef F.T.S.	
1	6		WSW.		
2	7	4	W*b*S.	S*b*W.	
3	7	3		In 2d reefs.	
4	7	4			
5	5	4			
6	5			Hard ſqualls	
7	5				
8	5			Down T.G.yards	
9	1			Rain.	
10	2	3	NW*b*W.	SW. Out 2d reefs	
11	3	3			Variation of the compaſs 26° W.
12	4				This Day at noon the ſhip is 18 miles to the ſouthward of account.
	92				

Courſe.	Diſt.	S.	W.	Lat. A.	Lat. Obſ.	Diff. Long.	Long in.
S. 72° W.	89	27	85	47° 52′ N	47° 34′ N.	2° 7′ W.	9° 51′ W.

The Day's Work, Feb. 20, 1772.

TRAVERSE TABLE.

Courſes.	D.	N.	S.	E.	W.
W*b*S.	38		7.4		37.3
W$\frac{1}{2}$N.	44	4.3			43.8
NW*b*W	10	5.6			8.3
		9.9 7.4	7.4		89.4

N. 88° W. 89. 2.5 89.4
20 W. variation
108 correct courſe from north
S. 72 W. correct courſe
89 diſtance
27 true ſouthing
85 true weſting.

Lat. ſailed from 48° 19′ N. M. P. 3320 0
Difference lat. .27 S.
Lat. by ac. 47. 52 N. M. P. 3279.6
Hence diff. long. 127′ or 2° 7′ W. 40.4
Or by mid. lat. 127′ or 2° 7′ W.
Long. ſailed from 7° 44′ W.
Diff. long. 2. 7 W.
9. 51 W.

Here it is to be obſerved, that on the firſt courſe W*b*S. the ſhip was going large, but at 12 P.M. ſhe hauled her wind, lying up WSW. On this courſe one point lee-way is allowed, which makes it W*b*S. Therefore the whole run till 1 A.M. is entered in the traverſe table on a W*b*S. courſe. At 1 A.M. the wind was ſhifted one point to the weſtward of ſouth, ſhe could therefore lie no better up than W*b*S. and as it was then blowing ſqually weather, the top-gallant-ſails being handed, and two reefs in the top-ſails 1$\frac{1}{2}$ point lee-way is allowed, which makes the courſe W. $\frac{1}{2}$ N. At 9 A.M. the courſe being NW*b*W. ſhe is no longer cloſe hauled, and therefore no lee-way is allowed. Moſt ſhips will lie within 6 points of the wind, and therefore in peruſing a journal, a ſhip is ſuppoſed to be cloſe hauled when the diſtance between the wind and the courſe do not exceed 6 points. We have allowed the lee-way here by eſtimation, but the practical navigator is again adviſed, not to ſatisfy himſelf by gueſſing, but to go aft frequently, and obſerve the ſhip's wake. The dead-reckoning is ſufficiently erroneous when ſailing upon a wind, without making it more ſo by gueſſing, where a little attention may produce a tolerable degree of cerainty.

The variation being allowed to the left hand of N. 88° W. produces a number which exceeds 90° the courſe, or the acute angle formed between the meridian and the line deſcribed by the ſhip, muſt conſequently lie to the ſouthward, and be reckoned from the ſouth. The complement to 108° is therefore taken.

The latitude ſailed from 48° 19′ N. is yeſterday's latitude by obſervation. It is obvious that the latitude by obſervation is in all caſes to be preferred to the latitude by account; the latter being entered in the journal when there is an obſervation, for no other *reaſon than to ſhew* how far the dead-reckoning agrees with the obſervation.

Ship Harmony from England towards Liſbon.

H.	K.	F.	Courſes	Winds, &c.	Friday, February 21, 1772.
1	4	4	WbN.	SWbS. Cloudy	
2	5		W.	SSW.	Light variable winds and unſettled weather.
3	4	4	W½S.	SbW.	A conſiderable ſwell from SW.
4	4	3		A ſail E.	
5	4	3	WbS.		
6	4		WSW.	S.	
7	2			Squally and rain.	
8	3		SSW.	NW. In 2 reefs.	
9	2	5	SWbW.		
10	2	3		Out reefs.	
11	3		SSW.	Fair.	
12	3				
1	2	2	SbW½W.		
2	2				
3	2	4			
4	3	2	S.	WSW.	
5	2	3	SbE.	SWbW.	
6	2				
7	2				
8	1	4			
9	1	4	SSE.	SW.	
10	1	3		Cloudy.	Variation 20° W.
11	1	3		4 ſail in ſight.	The ſituation of Cape Roxant, the bearing and diſtance of which is worked below, is,
12	1	2		Tacked.	Lat. 38° 42′ N. Long. 9° 35′ weſt of London.
	66				

Courſe	Diſt.	S.	W.	Lat A.	Lat O.	Diff. lo.	Lo. in	B. & diſt. C. Roxant.
S. 24° W.	41	37	17	46° 57′ N	47° 01′ N	0° 25′ W	10° 16′ W	S. 3½° E. diſt. 500 m.

The Day's Work, Feb. 21, 1772.

TRAVERSE TABLE.

Courſes	D.	N.	S.	E.	W.
WNW.	4	1. 5			3. 7
WbN.	5	1.			4. 9
W½N.	8	. 8			8.
W.	4				4.
WbS.	6		1. 2		5. 9
SSW.	9		8. 3		3. 4
SWbW.	5		2. 8		4. 2
SbW½W.	7		6. 7		2.
SbE½E.	3		2. 9	0. 9	
SSE½E.	8		6. 2	3. 3	
SE½S.	6		4. 6	3. 8	
		3. 3	32. 7 3. 3	8. 0	36. 1 8.
S. 44° W.	41		29. 4		28. 1

20

S. 24 w. correct courſe

41 diſtance

37 true ſouthing

17 true weſting

One point lee-way is allowed to the right-hand of each courſe till ſeven P.M. at which time the wind came round to the northward. Conſequently no allowance is made on the four following courſes. But at 3 A.M. the wind became more ſoutherly, and the three remaining courſes were made as near as ſhe would lie on the ſtarboard tack, that is with the wind on the right hand. One point and half lee-way is therefore allowed on each of them to the left hand.

As we are now out at ſea, and can ſteer a direct courſe to our intended port, if the wind be fair, it will be uſeful to have the bearing and diſtance of Cape Roxant, which is the point of land that lies to the north of the entrance of the River Tagus, upon the ſhore of which Liſbon is ſituated. This bearing and diſtance is worked according to precept 12. with which it may be compared. In ſeeking in the table, the fourth part of each number was uſed, becauſe the numbers themſelves are too large.

Lat. ſailed from	47° 34′ N.	M.P. 3252.9
Difference of latitude	. 37 S.	
Latitude by account	46. 57 N.	M.P. 3198.4
Hence difference of long.	24. 6 W.	54.5
Or by middle latitude	25 miles	
Longitude ſailed from	9° 51′ W.	
Difference of longitude	25 W.	
Longitude in	10. 16 W.	

To find the Bearing and Diſtance of Cape Roxant.

Lat. ſhip by obſervation	47° 01′ N.	M.P. 3204.2	Ship's longitude	10° 16′ W.
Latitude of Cape Roxant	38. 42 N.	M.P. 2521.8	Cape's longitude	9.35 W.
	8. 19 or 499′	682.4	Difference of longitude	.41 E.

Hence courſe or bearing S. 3½° E. diſtance 500 miles, from ſhip.

Ship Harmony from England towards Liſbon.

H.	K.	F.	Courſes.	Winds, &c.	Saturday, February 22, 1772.
1	2	3	NWbW	SWbW. Cloudy	
2	2	3	NNW½W	WbS	
3	3	2	NNW	W	An increaſing gale, ſqually with rain.
4	2	5	NWbN	WbS	A large ſwell from the SW quarter.
5	3	3	NW	WSW	
6	3	2		In 1 reefs	
7	3	4	NW½W	SWbW	
8	3		NWbW	Hazy	
9	2	4	NW½W		
10	2		NWbW		
11	2	2	WbN	SWbS	
12	2		WNW½N	SWbW	
1	2		WbN	SWbS	
2	2				
3	3		WSW	S	
4	3	4			
5	6		SW½W	SSE	
6	7	4		Squally and rain	
7	8		SW	SEbS	
8	8		SWbW		
9	8				
10	7	5		SE. In 2 reefs	
11	8	2			
12	8			In 3 reefs	Variation 20° weſterly.
	104				

Courſe.	Diſt.	S.	W.	Lat. A.	Lat. O.	Diſt. Long.	Long. in.
S. 67° W.	73	28	67	46° 33′ N.	No. obs.	1° 38′ W.	11.54 W.

The Day's Work, Feb. 22. 1772.

TRAVERSE TABLE.

Courſes.	Diſt	N.	S.	E.	W.
NW	7	4.9			4.9
NbW½W	3	2.9			0.9
NbW	3	2.9			0.6
NNW	2	1.8			0.8
NWbN	7	5.8			3.9
NW½N	6	4.6			3.8
WNW	6	2.3			5.5
NW½W	2	1.3			1.5
WbS	7		1.4		6.9
SWbW	53		29.4		44.0
		26.5	30.8		72.8
			26.5		
S. 87° W	73		4.3		

20 W. Variation

S. 67 W. correct courſe

73 diſtance

28 true ſouthing

67 true weſting

Becauſe ſhe is cloſe hauled on the larboard tack till 6 A.M. one point lee-way is allowed to the right-hand of every courſe till that hour, excepting on the SW½W. courſe, which being 6½ points from the wind, has only half a point allowed, by which it becomes SWbW, and is reckoned together with the other SWbW. courſe, which begins at 7 A.M. and is made with the wind on the beam. The 8 knots on a ſouthweſt courſe at 7 A.M. are omitted, becauſe it is ſuppoſed that the ſwell of the ſea has driven the ſhip about as much in the contrary direction during the 24 hours.

Lat. ſailed from	47° 01′ N.	M. P. 3204.2
Difference of latitude	28 S.	
Latitude by account	46. 33 N.	M. P. 3163.3
Hence diff. long. 98 or	1.38 W.	40.9
And by middle latitude the ſame		
Longitude ſailed from	10° 10′ W.	
Difference of long.	1.38 W.	
Longitude in	11.54 W.	

Ship Harmony from England towards Liſbon.

H.	K.	F.	Courſes	Winds, &c.	Sunday, February 23, 1772.
1	6		WSW	SSE	
2	3			Handed T.S. and reefed M. S.	
3			up WSW off W*b*N		
4					
5					A hard gale with ſome ſevere ſquals and rain. A very heavy ſwell from WSW.
6					
7			up W*b*S off W*b*N½N		
8				Squally	
9			up W*b*S off WNW		
10					
11					
12					
1				Squally and rain	
2					
3			up WSW off WNW		
4					
5			up W off NW*b*N		
6			up W*b*N off NW		
7					
8			up WNW off NW		
9			up W*b*N off NW*b*W		
10					Variation 20 degrees weſterly.
11					
12					This day 12 miles to the northward of account

Courſe.	Diſt.	N.	W.	Lat. A.	Lat. obs.	Diff. Long.	Long. in.
N. 73° W.	51	15	49	46°48′N	47°00′N.	1° 12′ W.	13° 06′ W

The Day's Work, Feb. 23, 1772.

TRAVERSE TABLE.

Courſe.	D.	N.	S.	E.	W.
WSW	9		3.4		8.3
NW*b*W	8	4.4			6.6
NW	16	11.3			11.3
NW½W	4	2.5			3.2
NNW	6	5.5			2.3
N*b*W½W	2	1.9			0.6
NNW½W	8	7.			3.8
NNE	12	11.1		4.6	
		43.7	3.4	4.6	35.1
		3.4			4.6
N. 53° W.	51	40.3			30.5

20 W. variation.

N. 73 W. correct courſe

51 diſtance

15 true northing

49 true weſting

Latitude ſailed from 46° 33′ N. M. P. 3163.3
Difference of latitude 15 N.

Latitude by account 46.48 N. M. P. 3185.2

Hence diff. long. 72 or 1° 12′ W. 21.9
Longitude ſailed from 11° 54′ W.
Difference of longitude 1. 12 W.

Longitude in 13.06 W.

In hard blowing weather, when the wind is contrary and the ſea high, it is impoſſible to gain any advantage by ſailing. In ſuch caſes, therefore, the object is to avoid as much as poſſible the being driven back again. With this intention it is uſual to lie too under no more ſail than is ſufficient to prevent the violent rolling which the veſſel would otherwiſe acquire, to the endangering her maſts and ſtraining her timbers, &c. A ſhip in theſe circumſtances, is affected with a continual ſlow horizontal libration, by which her head is alternately brought up towards the wind, and falls off again. The middle point of the compaſs between her coming too and her falling off, is reckoned to be her courſe, and the lee-way is allowed from thence. Three points and a half are here allowed on each courſe to the right-hand. The violence of the wind renders it impoſſible to heave the log, becauſe more of the line would run out in a bend or bight to leeward, than would be drawn by the log itſelf; but the run may be eſtimated by throwing a chip of wood overboard, and obſerving the diſtance it is removed to in a quarter of a minute. The diſtance here allowed is two knots an hour. The laſt courſe NNE 12 miles, is allowed for the drift of the ſhip by the ſwell of the ſea which ſets in that direction.

Ship Harmony from England towards Liſbon.

H.	K.	F.	Courſes.	Winds, &c.	Monday, February 24, 1772.
1			up NW*b*W off NW	Hazy	
2					
3				Hard ſquals and rain	
4				In ſp. ſ. yd. & jib boom	Firſt part ſtrong gales with very hard ſquals and a high ſea; latter more moderate & the ſwell conſiderably abated.
5			up NW off N	Down mz. t. ſ. & croſjack yard upon deck	
6					
7				Struck mz. topmaſt	
8				Squally	
9			up NW off N*b*W		
10				Fair	
11				Ship'd ſome water	
12				Cloudy	
1			up WNW off NW*b*N		
2					
3			up W*b*N off NW *b*W		
4				Squally	
5			up W*b*N off NW		
6					
7					
8	1	3	NW*b*W	SW*b*W	
9	1	5			
10	2		WNW	SW. Small rain	
11	2	3			
12	2	3		Hard rain	
	10			wore ſhip	Variation 20° weſt

Courſe.	Diſt.	N.	W.	Lat. A.	Lat. Ob.	Diff.Lo.	Long. in
N. 27° W.	39	35	18	47°35′N.	No obs.	26′ W.	13°32′W

The Day's Work, Feb. 24, 1772.

TRAVERSE TABLE.

Courſes.	D.	N.	S.	E.	W.
N½W	6	6.			0.6
NNE	8	7.4		3.	
N*b*E½E	8	7.7		2.3	
N*b*W	4	3.9			0.8
NW*b*N	10	7.7			6.3
NNW½W	4	3.5			1.9
NNW	3	2.8			1.1
		39.0		5.3	10.7
					5.3
N. 7° W.	39				5.4

20 W. variation

N. 27 W. correct courſe

39 diſtance

35 true northing

18 true weſting

The wind increaſing towards night, four points are allowed for lee-way on the three firſt courſes; three and a half on the next, and three points on the remaining courſes. The laſt courſe WNW. is taken together with the courſe which begins at 2 A.M. The ſuppoſed diſtance on the courſes after midnight, are taken at leſs than two knots, becauſe the gale began to be more moderate.

Latitude ſailed from	47° 00′	N.	M. P.	3202.8
Difference of latitude	35	N.		
Latitude by account	47. 35	N.	M. P.	3254.4
Hence diff. long.	26′	W.		51.6
Longitude ſailed from	13°06′	W.		
Difference of longitude	26	W.		
Long. in	13. 32	W.		

Ship Harmony from England towards Liſbon.

H.	K.	F.	Courſes.	Winds, &c.	Tueſday, February 25, 1772.
1	1	5	SSE	SW. Cloudy	
2	1	5		3 ſail in ſight	
3	2		S*b*E½E	Set F. T. S.	A freſh breeze with hazy weather and ſome rain. A conſiderable ſwell from SW.
4	2	4	SSE	Squally	
5	2	3			
6	3				
7	2	4		In both T. S.	
8	2	3			
9	2	2	S*b*E	SW*b*W	
10	2				
11	2				
12	2			Cloudy. Set T. S.	
1	2	4	SSE	SW	
2	1	2			
3	2	3	S*b*E	SW*b*W	
4	2	4			
5	2	3	S	WSW	
6	2	3		A ſail NW	
7	2	3	S*b*E	SW*b*W	
8	2	2		Out 3d reefs	
9	2	5		Hazy	
10	2		SSE	SW. out reef M. S.	
11	2		S*b*E½E		
12	3			Squally	Variation 20° W.
	54				

Courſe.	Diſt.	S.	E.	Lat. A.	Lat. Ob.	Diff. Lo.	Long. in	B.&D. Ca. Roxant.
S. 65° E.	54	23	50	47° 12′ N.	47° 20′ N.	1 13 E.	12° 19′ W	S. 13° E. 530 miles

The Day's Work, Feb. 25, 1772.

TRAVERSE TABLE.

Courſes.	D.	N.	S.	E.	W.
SE*b*E	8		5	7.5	
SE	15		10.6	10.6	
SE½E	14		8.9	10.8	
SE½S	12		9.3	7.6	
SSE½E	5		4.4	2.3	
S. 45 E.	54		38.2	38.8	

20 W. variation

S. 65 E. correct courſe

54 diſtance

23 true ſouthing.

50 true eaſting.

Three points lee-way are allowed on the SSE and S*b*E courſes, while the top-ſails were not ſet. Two points and a half are allowed on all the other courſes. The bearing and diſtance is worked as on the 21ſt paſt.

Latitude ſailed from	47° 35′ N.	M. P. 3254.4
Difference of latitude	23 S.	
Latitude by account	47 12 N.	M. P. 3220.4
Hence diff. long.	1° 13′ E.	34.0
Longitude ſailed from	13° 32′ W.	
Difference of longitude	1.13 E.	
Longitude in	12.19 W.	

To find the Bearing and Diſtance of Cape Roxant.

Lat. ſhip by obſ.	47° 20′ N.	M. P. 3232.2	Ship's longitude	12° 19′ W.
Lat. Cape Roxant	38.42 N.	M. P. 2521.8	Cape's longitude	9. 35 W.
	8.38 or 518′	710.4	Diff. long.	2. 44 or 164′ E. from ſhip.

Hence courſe or bearing S. 13° E. 530 miles

Ship Harmony from England towards Liſbon.

H.	K.	F.	Courſes	Winds, &c.	Wedneſday, February 26, 1772.
1	3	4	S*b*E	SW*b*W. cloudy	
2	3	3		Paſſed a ſhip	
3	3	3	S ½ E	ſtanding NW.	Firſt part variable winds and weather; latter an
4	3	2		Up mz. t. maſt & ys	increaſing breeze with rain.
5	3	4	S*b*E	Bent mz. t. ſ.	
6	3	2		Hazy.	
7	2	3			
8	2	4			
9	3	4	S ½ E		
10	4				
11	3	5			
12	3	5		Hard rain	
1	3				
2	1	4			
3			Head SW	Calm	
4			Head S		
5	2	5	S	N. cloudy	
6	3				
7	3			Out all reefs	
8	4	4			
9	6			NNE	
10	6			Out jib b. and up	
11	6			t. g. m. & yds.	
12	5	4		Rain	Variation 20° weſt.
	104			A ſail bear. E*b*N	

Courſe	Diſt.	S.	E.	Lat. A.	Lat. Obſ.	Diff. Lo.	Long. in	B. & D. Cape Roxant
S. 34° E.	79	65	44	46° 15′ N.	No obſ.	1° 04′ W.	11.15 W.	S. 10° E. 460 m.

The Day's Work, Feb. 26, 1772.

TRAVERSE TABLE.

Courſes	Diſt.	N.	S.	E.	W.
SE*b*E	19		15. 8	10. 5	
SSE ½ E	6		5. 3	2. 8	
S*b*E ½ E	19		18. 2	5. 5	
S	37		37.		
S. 14° E.	79		76. 3	18. 8	

Two points lee-way are allowed on the courſes till 8 P.M. One point is allowed on the S. half E. courſe. And the ſouth courſe is large.

20

S. 34 E. correct courſe

79 diſtance

65 true ſouthing

44 true eaſting

Lat. ſailed from	47° 20′ N.	M.P.	3232.2
Difference of lat.	1. 05 S.		
Lat. by account	46.15 N.	M.P.	3137.2
			95.0
Hence diff. long.	1° 4′ E.		
Long. ſailed from	12° 19′ W.		
Diff. long.	1.04 E.		
Long. in	11.15 W.		

To find the Bearing and Diſtance of Cape Roxant.

Lat. ſhip	46° 15′ N	M.P.	3137.2	Ship's long.	11° 15′ W
Cape's lat.	38. 42 N	M.P.	2521.8	Cape's long.	9. 35 W
	7.33 or 453′		615.4	Diff. long.	1. 40 or 100′ E. from ſhip.

Hence courſe or bear. S. 19° E. 460 miles

Ship Harmony from England towards Liſbon.

H.	K.	F.	Courſes	Winds, &c.	Thurſcay, February 27, 1772.
1	7	4	S.	NNE hazy.	
2	8				
3	8	2			Freſh breezes throughout, with hazy weather in the firſt part, middle ſqually, and latter part fair.
4	8	2			
5	8	3			
6	9				
7	8	4		In 1 reef	At half paſt 7 A.M. ſaw the land bearing from S*b*E½E. to SSE½E. diſtant about 12 leagues.
8	8	4		N	
9	S	5		N*b*E	
10	8	2		NE*b*N. ſqually	At noon Cape Finiſterre bore S*b*E½E. diſtant 6 leagues. The northernmoſt land in ſight SE*b*E½E.
11	7	4			
12	7	2		Cloudy	
1	7				From the ſituation of Cape Finiſterre in Latitude 43° 15′ N. &lo. 9° 20′ W. and this bearing I find.
2	8				
3	7				
4	8				Ship's true place lat. 43° 30′ N. Lo. 9°34′W.
5	7	2			Ship's pl. by D.R. lat. 43. 33 N. Lo. 10.01 W.
6	7	3		N fair	
7	6	4		Up Mz.T.G.M. out Spr. S. Y.	Whence Sh. is fr. rec. 00. 3′ N. 00.27 E.
8	5	3			
9	5	2		Out 1 Reef	
10	4	2		3 ſail in ſight	
11	4			N*b*E	
12	4			NNE	Variation 18° W.
	170				

Courſe	Diſt.	S.	E.	Lat. A.	Lat. Obſ.	Diff. long.	Long. in.
S. 18 E.	170	162	52	43° 33′ N	43° 30′ N.	1° 14′ E.	10.01 W.

The Day's Work, February 27, 1772.

S. 18 E. correct courſe

170 diſtance

162 true ſouthing

52 true eaſting

Lat. ſailed from 46° 15′ N. M.P. 3137.2
Difference of lat. 2. 42 S.

Lat. by account 43. 33 N. M.P. 2908.4

Hence diff. long. 74 or 1° 14′ E. 228.8
Long. ſailed from 11° 15′ W.
Diff. long. 1. 14 E.

Long. in 10. 01 W.

Now, to find the error of the dead-reckoning, it will be proper to find the ſhip's place from the bearing of Cape Fiuiſterre at noon. The ſhip's true ſituation at noon is the ſame as it would have been if ſhe had ſailed 6 leagues from Cape Finiſterre on a courſe oppoſite to the bearing. Therefore,

Courſe N*b*W½W. or N. 17° W. is the apparent courſe.
18 W. variation

N. 35 W. correct courſe

18 diſtance

15 true northing

10 true weſting

Lat. C. Finiſterre 43° 15′ N. M.P. 2883.7
Diff. lat. 15 N.

Ship's lat. 43. 30 N. M.P. 2904.3

Hence diff. long. 14′ W.
Long. C. Finiſterre 9° 20′ W.
Diff. long. 14 W.

Ship's long. 9.34 W.

Lat. by D.R. 43° 33′ N.
Lat. from bear. 43. 30 N.

Error of lat. 3′ S. of reckoning.

Long. by D.R. 10° 01′ W.
Long. by bearing 9. 34 W.

Error of long. 27 E. of reckoning.

Ship Harmony from England towards Liſbon.

H.	K.	F.	Courſes.	Winds, &c.	Friday, February 28, 1772
1	4	4	SbW½W.	NNE. Fair.	
2	4	2			A pleaſant gale, and moſtly fair weather.
3	4				At 6 P.M. Cape Finiſterre bore
4	4				
5	4			NE. Squally.	NEbE½E. diſtant 5 leagues.
6	4	5		In 1 reef.	
7	4	5			I take my departure from Cape Finiſterre,
8	5				its ſituation being as noted in yeſter-
9	5	4		Fair.	day's log.
10	5	4			
11	6				
12	6				
1	6				
2	6	2			
3	6	4			
4	7			N.	
5	7			Hazy.	
6	7			Out 1 reef.	
7	7	4			
8	7	5			
9	8				
10	8			3 ſail in ſight.	
11	8	5			
12	9	2			Variation 18° W.
	147				

Courſe.	Diſt.	S.	W.	Lat. A.	Lat. Ob.	Diff. Long.	Long. in.
S. 4° W.	122	122	8	41° 13′ N.	41° 12′ N.	11′ W.	9° 31′ W.

The Day's Work, Feb. 28, 1772.

TRAVERSE TABLE.

Courſes.	D.	N.	S.	E.	W.
SWbW½W.	15		7.0		13.2
SbW½W.	122		116.7		35.4
S. 22° W.	[illegible]		123.7		48.6

Here a new departure is taken from Cape Finiſterre, it being always proper to begin the reckoning anew, when it can be done from the ſight of lands whoſe latitude and longitude are known.

18 W. variation.

S. 4 W. correct courſe

122 diſtance

122 true ſouthing

8 true weſting.

Lat. ſailed from 43° 15′ N. M. P. 2883.7
Diff. lat. 2. 2 S.

Lat. by ac. 41. 13 N. M. P. 2718.9

Hence diff. long. 11′ W. 174.8
Long. ſailed from 9° 20′ W.
Diff. long. 11

Long. in 9. 31 W.

Ship Harmony from England towards Liſbon.

H.	K.	F.	Courſes.	Winds, &c.	Saturday, February 29, 1772.
1	9		SSW½W.	N. Fair.	
2	8	4			
3	8				A pleaſant breeze and fine weather.
4	8				
5	8			In 2 reefs.	At day break Cape Roxant bore S*b*E½E,
6	8			NNW.	diſtant 11 or 12 leagues.
7	8				
8	7	4			
9	7	5			
10	7	5			
11	7	6			
12	7	6			
1	7	5			
2	7	4			
3	6	5			
4	6	5			
5				Lay too.	
6				Made ſail.	
7					
8					
9					
10					
11					
12					Variation 18° W.

Courſe.	Diſt.	S.	W.	Lat. A.	Lat. Ob.	Diff. Long.	Long. in.
S. 10° W.	124	122	21	39° 10′ N.		28′ W.	9° 59′ W.

The Day's Work, Feb. 29, 1772.

SSW½W. or S. 28 W.	Lat. ſailed from	41° 12′ N.	M. P. 2717.5
18 W. variation	Diff. lat.	2. 12 S.	
S. 10 W. correct courſe	Lat. by ac.	39 10 N.	M. P. 2557.8
124 diſtance	Hence diff. long. 28′ W.		159.7
	Long ſailed from	9° 31′ W.	
122 true ſouthing	Diff. long.	28	
	Long. in	9.59 W.	

The ſhip's track during this voyage is marked off from the latitudes and longitudes at noon, upon the Mercator's chart. Figure 101.

CHAP. IX.

OF SURVEYING OF HARBOURS AND COASTS.

THE former parts of this treatiſe contain ſuch branches of knowledge as cannot, with propriety, be neglected by him who undertakes to conduct a ſhip with ſafety from one remote port to another. The leiſure which a ſeafaring life affords, ought to be an inducement with the young navigator, not only to acquire thoſe, but likewiſe ſuch additional parts of the ſciences as may, in any reſpect, tend to mature his judgment, or enable him to contribute his ſhare towards the improvement of the geography of diſtant places. It is indeed a reproach to the mariners of Great Britain, that while they ſhew the moſt laudable ambition to excel in every thing relating to the practical management and conduct of a ſhip, the ſcientific part is wretchedly neglected. There are many coaſts along which ſhips often ſail, there are many ſtraits through which they uſually paſs, which are ſo far from being known the better in conſequence of the experience of ſo many veſſels, that to this day they are traverſed with the long-boat a-head to take the ſoundings continually. This great defect is owing to a want of care in taking the bearings with the azimuth compaſs, to a neglect in not heaving the log when under way, and obſerving the ſet and velocity of the tides when at anchor. In fact, if we conſider the improvements in naval geography, we ſhall find that the number of perſons who have made them, are ſo few, that it is hardly at all difficult to enumerate their names even from memory; and when we reflect how eaſy it is to make the neceſſary obſervations for aſcertaining a number of very deſireable particulars, we cannot help exceedingly regretting that they are ſo univerſally omitted. A ſea journal is ſeldom regarded but as far as it is uſeful in that particular voyage for which it is kept; whereas it ought to be made the repoſitory of facts, regiſtered not only with that view, but for the future advantage of the poſſeſſor and the public. With this latter intention, all obſervations of latitude, longitude, variation of the compaſs, views of lands, &c. ought to be as frequently and carefully made when the ſhip's place is known from the viſible bearing of lands, as at any other time. Every perſon who is ever ſo little acquainted with naval affairs, muſt know how uſeful theſe particulars would prove in the hand of one who has to go over the ſame tracts; and, notwithſtanding this, the buſineſs is ſo little attended to, that one is almoſt tempted to imagine the contrary opinion to be by far the moſt prevalent.

The attention of the rational navigator ought to be particularly directed towards the diſcovery of the longitude at ſea, a purſuit which, by the many inadequate attempts of perſons who, for want of experience, were not aware of its difficulties, is become almoſt the baſis of a proverb expreſſing fruitleſs labour. It belongs to the practical ſtudent to determine how far patient induſtry and ſkilful perſeverance may ſerve to render teleſcopes and other inſtruments manageable on ſhipboard, and it is from the reſult of his labours that the degrees of accuracy attendant on the ſeveral kinds of obſervation, muſt be aſcertained. It cannot, therefore, be too earneſtly recommended to be attentive in acquiring the habit of application to ſubjects of this nature: a habit which never fails to produce diſtinction and advantage to him who poſſeſſes it, and is of the higheſt importance to the public in its effects.

Surveying of harbours is a performance which it is very neceſſary to attend to. If the courſe and diſtance run by a ſhip along any coaſt, be noted in the log-book, with the ſoundings and bearings of land taken by the azimuth compaſs, a chart of the coaſt may be drawn, which will be of conſiderable ſervice where a better cannot be had. For the ſhip's way being marked off or conſtructed, and the lines of the bearing of any point of land drawn from each extremity of this courſe, as in Ex. 1. chapter 2. book 2. their interſection will give the place of the point. Other points, or remarkable parts of the land, may be laid down in like manner, and a curve line drawn by hand thro' all the points, and with the ſame inflections, &c. as the ſhore appears to have by looking at it, will repreſent the coaſt itſelf. It is not neceſſary to make the computations in this buſineſs, becauſe the geometrical conſtruction is exact enough for the purpoſe.

It may be proper, in this place, to inform thoſe navigators, that they are miſtaken, who may imagine it to be much leſs trouble to take the bearings of land with the common bitacle compaſs, than with the azimuth compaſs. For without conſidering the ſuperior accuracy of obſerving with this laſt inſtrument, its facility in uſe, is ſuch, that no one who has ever [illegible] applied it to this purpoſe, will afterwards think of uſing the other. The method is this. Set the index at 0, and move the whole body of the compaſs (without altering the poſition of the index) till the thread ſeen thro' the ſight, cuts the lands required to be ſet. Then immediately look at the card, and the degrees cut by the black line in the box under the 0, will be the bearing ſought.

The moſt accurate method of laying down the poſition of lands or coaſts, is from obſervations made on ſhore. Theſe obſervations all depend on plane trigonometry, as do likewiſe thoſe which it is neceſſary to make on the water, as far as poſition is concerned. The following precepts will ſerve to methodize and explain the buſineſs.

Precepts for Surveying Harbours, &c.

1. Make a rough ſketch of the coaſt or harbour, and mark every point of land, or particular variation of the coaſt, with ſome letter of the alphabet. Either walk or ſail round the coaſt, and fix a ſtaff with a white rag at the top, at each of the places marked with the letters of the alphabet. If there be a tree, houſe, white cliff, or other remarkable object at any of theſe places, it may ſerve inſtead of a ſtation-ſtaff.

2. Chuſe ſome level ſpot of ground upon which a right line called a Fundamental Baſe, may be meaſured either by a chain, a meaſuring-pole, or a piece of log-line marked into feet. Generally ſpeaking, the longer this line the better: its ſituation muſt be ſuch, that the whole or moſt part of the ſtation-ſtaves may be ſeen from both ends thereof, and its length and direction muſt, if poſſible, be ſuch, that the bearing of any ſtation-ſtaff, taken from one of its ends, may differ at leaſt ten degrees from the bearing of the ſame ſtaff taken from the other end. Station-ſtaves muſt be ſet at each end of the fundamental baſe.

If a convenient right line cannot be had, two lines and the interjacent angle may be meaſured, and the diſtance of their extremes found by conſtruction or computation, may be taken as the fundamental baſe.

3. Find the bearing of the fundamental baſe by the compaſs, as accurately as poſſible. With Hadley's quadrant, or any other inſtrument equally exact, take the angles formed at one end of the baſe, between the baſe line and lines drawn to each of the ſtation-ſtaves, take likewiſe the angles formed between the baſe line and lines drawn to every remarkable object near

the ſhore, as houſes, trees, windmills, churches, &c. which may be ſuppoſed uſeful as pilot-marks. From the other end of the baſe, take the angles formed between the baſe and lines drawn to every one of the ſtation-ſtaves and objects. If any angle be greater than the arc of the quadrant, meaſure it at twice, by taking the angular diſtance of ſome intermediate object from each extreme object. Enter all theſe angles in a book as they are taken.

4. Draw the fundamental baſe upon paper from a ſcale of equal parts, and from its ends reſpectively draw unlimited lines, forming with it the angles taken in the ſurvey, and mark the extreme of each line with the letter of the ſtation to which its angle correſponds. The interſection of every two lines whoſe extremes are marked with the ſame letter, will denote the ſituation of the ſtation or object to which, in the rough draught that letter belongs. Through or near all the points of interſection which repreſent ſtation-ſtaves, draw a waving line with pencil, to repreſent the coaſt.

5. At low water ſail about the harbour, and take the ſoundings, obſerving whether the ground be rocky, ſandy, ſhelly, &c. Theſe ſoundings may be entered by ſmall numeral figures in the chart, by taking at the ſame time the bearings of two remarkable objects. In this excurſion be particular in examining the ground off points of land which project out into the ſea, or where the water is remarkably ſmooth, without a viſible cauſe, or in the vicinity of ſmall iſlands, &c. Obſerve the ſet and velocity of the tide of flood, by heaving the log while at anchor, and denote the ſame in the chart by ſmall darts. The time of high water is denoted by Roman numeral letters. Rocks are denoted by ſmall croſſes. Sands by dotted ſhading, the figures upon which uſually ſhew the depth at low water in feet. Good anchoring places are marked by a ſmall anchor. Upon coming near the ſhore, care muſt be taken to examine and correct the outline of the chart, by obſerving the inflections, creeks, &c. more minutely.

6. In a ſmall ſailing veſſel go out to ſea, and take drawings of the appearance of the land, with its bearings. Sail into the harbour, obſerve the appearance of its entrance, and particularly whether there be any falſe reſemblance of an entrance by which ſhips may be deceived into danger. Remark the ſigns or objects, by attending to which, the harbour may be entered in ſafety, more eſpecially where it can be done, let the ſhip ſteer to the anchoring place, keeping two remarkable objects in one, or on a line.

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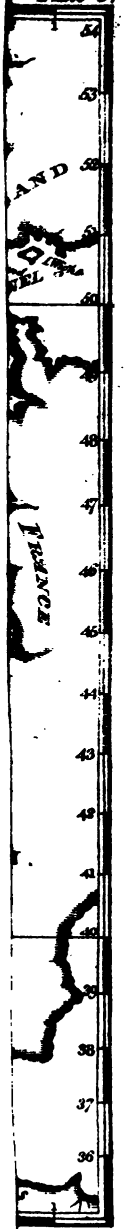


7. Coaſts are ſhaded off on the land ſide. Houſes, churches, trees, &c. on ſhore, are drawn ſmall in their proper figures. In a proper place of the chart draw a mariner's compaſs, to denote the ſituation of the rhumbs, &c. and on one ſide of the fleur-de-lis, draw a faint half fleur-de-lis at the point of north by compaſs. Draw alſo a divided ſcale of miles or leagues, which muſt be taken from the ſame original ſcale as the fundamental baſe.

Charts or plans may be neatly drawn with Indian ink, or the pen and common ink, and are as uſeful as any others. But they are frequently done in water colours, for which purpoſe the beginner will derive more advantage from viewing a proper drawing, or from overlooking a proficient at work, than from a multitude of written inſtructions.

An Example to illuſtrate the foregoing Precepts.

Let ABCDEFGH repreſent a coaſt to be ſurveyed, and IKL an adjacent iſland. It is required to make an accurate chart of the ſame.

To make the Actual Obſervations on Shore. Fig. 102.

By ſailing or walking along the ſhore a rough ſketch is made, and ſtation-ſtaves ſet up at the points of land A, B, C, D, E, F, G, H, and alſo at I, K, L, on the iſland. (Precept 1.)

During this operation, it is obſerved that no proper place offers itſelf at which a fundamental baſe can be drawn, ſo as to command at once a view of all the ſtations. It will therefore be neceſſary to ſurvey the coaſt in two ſeparate parts, by making uſe of two baſe lines. If the coaſt had been more extended, or irregular, a greater number of baſe lines might have been neceſſary.

Between the points B and C the ground is level, and a conſiderable number of the ſouthernmoſt points may be ſeen from both points, conformably to precept 2. Make BC, therefore, the firſt fundamental baſe. Its length by admeaſurement is found to be 812 fathoms, and its bearing by compaſs from B to C is N. 11° 14′ E. From each end of this baſe meaſure with Hadley's quadrant the angles formed between it and lines drawn to each ſtation in ſight. (Precept 3.) Enter or tabulate them as follows.

Firſt fundamental baſe BC=812 fatham. Bearing of C from B, N. 11° 14′ E.

Angle ABC=135° 07′	Angle ACB= 22° 54′
LBC= 85. 00	LCB = 71. 02
KBC= 56. 28	KCB = 91. 40
EBC = 43. 32	ECB =113. 50
DBC = 13. 30	DCB =145. 20

After having made theſe obſervations, it will be requiſite to proceed to the northern part of the coaſt. In all caſes where a coaſt is ſurveyed in ſeparate parts, it is beſt to meaſure a new fundamental baſe for each part, when it can be conveniently done. A line from the ſtation E drawn towards F, is well adapted to our purpoſe. Let EP, therefore, be the ſecond baſe line. Its length by admeaſurement is found to be 778 fathoms, and its bearing by compaſs from E to P, N. 38° 20′ E. Meaſure the angles formed by lines drawn from each end of this baſe, as before directed, and tabulate them as follows.

Second fundamental baſe EP=778 fathom. Bearing of P from E, N. 38° 20′ E.

Angle HEP=88° 30′	Angle HPE= 73° 00′
IEP = 71. 32	IPE = 28. 54
GEP=43. 59	GPE=111. 00
FEP=27. 51	FPE =127. 18

It is ſufficiently apparent that the connection between the two parts of this ſurvey, is preſerved by the ſecond fundamental baſe being drawn from the point E, whoſe ſituation was before determined by obſervations from the firſt baſe line. If this particular poſition of the ſecond baſe had not been convenient, and it had been taken at a diſtance from every point determined in ſituation from the firſt baſe, the connection would have required an obſervation of the bearing of one of the ſaid points from each end of the ſecond baſe. Thus, ſuppoſe the line IP to be the ſecond baſe line inſtead of EP, the poſition of IP with reſpect to the given point E, may be known by taking the bearings of E from I and P.

All the obſervations which are required to be made on ſhore being now completed, it will be adviſeable to conſtruct the chart, before we proceed to the other obſervations on the water. For, by this method, an opportunity is offered of drawing the waving line of the coaſt with more correctneſs than could otherwiſe be obtained.

Geo-

Geometrical Conſtruction. Fig. 103.

On the point B as a center, deſcribe the circle n e s w, the diameters n s and w e being at right angles to each other, and repreſenting the meridian and parallel. From n ſet off the arc nN equal to the quantity of the variation of the compaſs. Draw the diameter NS and the diameter WE at right angles to the ſame.. Theſe lines will repreſent the magnetic meridian and its parallel of latitude.

From the center B, draw the firſt baſe line BC=812 fathom N. 11° 14′ E. by compaſs. From one extremity B, draw the unlimited lines Ba, Bl, Bk, Be, Bd, forming reſpectively with the baſe the angles obſerved from thence. From the other extremity C, draw the unlimited lines Ca, Cl, Ck, Ce, Cd, forming reſpectively with the baſe the angles obſerved from thence. The interſections of lines terminated by the ſame letter will give the ſtations A, L, K, E, D. (Precept 4.)

Draw the line BQ, N. 38° 20′ E. by compaſs, and from E draw EP=778 fathom in the ſame direction or parallel to it, EP will be the ſecond baſe line. From one extremity E, draw the unlimited lines Eh, Ei, Eg, Ef, forming reſpectively with the baſe the angles obſerved from thence. From the other extremity P, draw the unlimited lines Ph, Pi, Pg, Pf. The interſections of lines terminated by the ſame letter will give the ſtations H, I, G, F. (Precept 4.)

Near the points A, B, C, D, E, F, G, H, draw a waving or irregular line to repreſent the coaſt. Draw alſo by the help of the points I, K, L, a line to repreſent the coaſts of the Iſlands.

The chart being thus far delineated, it will be proper to make the obſervations which are required on the water.

To make the actual Obſervations on the Water.

Precept 5. ſufficiently explains the buſineſs to which it is neceſſary to attend on the water. Nothing more, therefore, need be added here, except an elucidation of the method by the place at which any obſervation is made may be found on the chart. The place of an obſerver, may be determined by the bearings of two known objects, or by the bearing and diſtance of one known object. The intelligent practitioner will find reaſons for occaſionally prefering each of theſe methods; but, as the diſtance in the ſecond method is known only by eſtimation, we have given the preference to the firſt in the preſent example. All the ſoundings, &c. are ſuppoſed to be laid down by theſe methods; but, to prevent confuſion and prolixity, the lines of bearing are drawn only from the points M, N and O.

From the ſouthern extremity M of the reef of rocks which runs off the point L, the bearings of the ſtations C and D are taken by the compaſs as follows, viz. C, N. 62° E. and B N. 85° E.

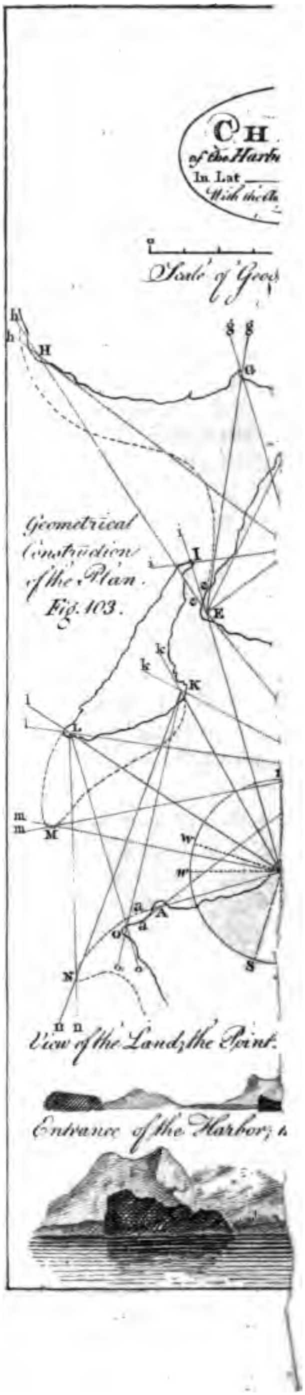
On the chart, therefore, from C, draw the oppoſite rhumb Bm S. 62° W. and from C, parallel to the rhumb BR, draw the oppoſite rhumb Cm S. 85° W. Their interſection M will be the extremity of the reef of rocks.

Again, from the Sand head N, the bearings of the ſtations L and K are taken by compaſs as follows, viz. L, N. 17° W. and K, N. 5° E.

On the chart draw the rhumb Bn, N. 17° W. and from L, parallel to the ſame, draw the oppoſite rhumb Ln. Draw likewiſe the rhumb BT, N. 5° E. and from K, parallel to the ſame, draw the oppoſite rhumb Kn. The interſection of theſe two laſt lines will be the Sand-head.

And the ſituation of the point of land O, which lies ſo that it cannot be ſeen from either of the baſe-lines, is determined in like manner from the bearings of L and K. Though in practice it may have been more convenient to ſettle its place from a ſingle bearing and diſtance of the ſtation A.

The two views of the land are ſuppoſed to be taken in conformity to precept 6. The art of deſigning is of ſuch great advantage to every one who viſits remote places, that it well deſerves to employ a part of that leiſure which a ſeafaring life affords. But they who are unſkilled in this art, and yet deſirous of enriching their journals with every uſeful particular, need not be diſcouraged from the attempt to make ſketches of the lands they come in ſight of. For, in general, thoſe drawings of lands which are the moſt uſeful, are ſuch as are taken from a great diſtance in the offing. Theſe, and indeed almoſt every other ſketch of this nature, require no ſhading, as their chief excellence conſiſts in the accuracy of the outline. Now, any careful and attentive perſon may make this outline as follows. Draw a ſtrait line upon paper to repreſent the apparent horizon or edge of the ſea, make a dot in the middle of this line to divide it by eſtimation into two equal parts; ſubdivide the


CH
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Geometrical Construction of the Plan. Fig. 103.
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View of the Land, the Point
Entrance of the Harbor;

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the parts in the ſame manner, and repeat this operation as often as may be thought neceſſary; look at the land and imagine it to be divided in the ſame manner; transfer or copy the outline of the parts, into which the land was ſuppoſed to be divided, to their reſpective correſpondent places on the paper. When the outline is thus drawn, mend it by comparing it with the land; if it appears very incorrect repeat the whole operation. A very few trials will render it eaſy, and if there be any difficulty in conceiving the land to be divided into parts, it may be obviated by holding up the edge of a divided ruler between the eye and the land, and remarking where the diviſions fall.

The poſition of the compaſs is given from that of the circle NESW made uſe of in the conſtruction. And the ſcale of geographical miles is found from the conſideration that 1021 fathoms make one geographical mile. Take, therefore, 1021 from the ſame ſcale of equal parts as was uſed in laying down the fundamental baſes, and it will give one primary diviſion for the intended ſcale of miles.

APPENDIX.

CHAP. I.

THE METHOD OF FINDING THE LATITUDE FROM THE OBSERVATION OF TWO ALTITUDES OF THE SUN, AND THE INTERMEDIATE TIME.

* *Cautions which relate to the Proper Times for making the Obſervations.*

THE two obſervations muſt be always taken between nine in the morning, and three in the afternoon; but the nearer they are to noon the better; provided there be a ſufficient interval between them. The following directions will ſhew what interval is proper.

If both obſervations are in the forenoon, the interval of time between them muſt not be much leſs than half the diſtance of the firſt obſervation from noon.

If both obſervations are in the afternoon, the interval between them muſt not be much leſs than the diſtance of the firſt obſervation from noon.

If one obſervation is in the forenoon and the other in the afternoon, the interval of time muſt not exceed 4½ hours.

If the ſun's meridian zenith diſtance be conſiderably leſs than the latitude of the place, then the obſervations muſt be taken proportionably nearer to noon. Thus, if the latitude be double the ſun's meridian zenith diſtance, the firſt of two obſervations taken in the forenoon muſt not be before 9½ A.M.

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* Theſe cautions are taken from Dr. Maſkelyne's Britiſh Mariner's Guide; and the precepts, together with the greateſt part of the other matter relating to this problem, are copied from the nautical almanac for the year 1771, in which work, the curious navigator will find the moſt extenſive ſet of logarithmic ſolar tables hitherto publiſhed.

nor the ſecond before 10¾ A.M. or the firſt of two taken in the afternoon muſt not be taken after 1¼ P.M. nor the ſecond after 2½ P.M. and if one obſervation be taken in the forenoon, and the other in the afternoon, that in the forenoon muſt not be taken before 9½ A.M. nor muſt the interval between that and the afternoon obſervation be above 3½ hours. If the latitude be three times the ſun's meridian zenith diſtance, the firſt of two obſervations taken in the forenoon muſt not be before 10 A.M. nor the ſecond before 11 A.M. or the firſt of two taken in the afternoon muſt not be after 1 P.M. nor the ſecond after 2 P. M. Or, if one be taken in the forenoon, and the other in the afternoon, that in the morning muſt not be before 10 A.M. and the interval between them muſt not be above three hours. If the latitude be five times the ſun's meridian zenith diſtance, the firſt of two obſervations taken in the forenoon muſt not be before 10½ A.M. nor the ſecond before 11¼ A.M. or the firſt of two taken in the afternoon muſt not be after 0¾ P.M. nor the ſecond after 1½ P. M. Or, if one be taken in the forenoon, and the other in the afternoon, the morning one muſt not be before 10½ A.M. nor the interval between them be above 2¼ hours. If the latitude be twelve times the ſun's meridian zenith diſtance, the firſt of two obſervations taken in the forenoon muſt not be before 11 A.M. nor the ſecond before 11½ A.M. or the firſt of two taken in the afternoon muſt not be after 0½ P.M. nor the ſecond after 1 P.M. Or, if one be taken in the forenoon, and the other in the afternoon, the morning one muſt not be before 11 A.M. nor the interval between them be above 1½ hours. But if the ſun's meridian zenith diſtance be ſtill leſs in proportion to the latitude, it will be neceſſary to take the obſervations ſo much nearer to the noon, that the advantage of the method will be very much diminiſhed.

Precepts for making the Computation.

I. To the arithmetical complement of the logarithm coſine of the latitude by account, add the arithmetical complement of the logarithm coſine of the ſun's declination: call their ſum the Log. Ratio.

II. From the natural ſine of the greateſt altitude, ſubtract the natural ſine of the leaſt altitude: find the logarithm of their difference, and write it under log. ratio.

III. With half the elapſed time enter Table 4. and from the column of ½ elap. time, take out the logarithm anſwering thereto, which is alſo to be ſet down under log. ratio.

It is ſufficiently correct for common uſe to take the time to half minutes, but if greater accuracy is required, the difference between the two neareſt logarithms muſt be applied.

IV. Add theſe three logarithms together, and with their ſum enter the table, in the column of mid. time; where having found the logarithm neareſt thereto, take out the time correſponding to it, and put it down under half the elapſed time. Subtract the leſſer from the greater, their difference will be the time from noon when the greateſt altitude was taken.

V. With this time enter the table, and from the column of log. riſing take out the Logarithm correſponding thereto: from this logarithm ſubtract the log. ratio, the remainder will be the logarithm of a natural number, which being found in the common table of logarithms, and added to the natural ſine of the greateſt altitude, will give the natural ſine of the meridian altitude of the ſun.

From the meridian altitude of the ſun, the latitude of the place of obſervation is to be obtained by the problem at page 101.

N. B. If the latitude found by the above proceſs ſhould differ widely from the latitude by account, it will be proper to repeat the operation, uſing the latitude laſt found, inſtead of the latitude by account, till the reſult gives a latitude nearly agreeing with the latitude uſed in the computation.

EXAMPLES.

EXAMPLE I.

Being at ſea in the latitude of 47° 19′ N. by account, when the ſun's declination was 12° 16′ N. at 10h. 24′ A.M. per watch, the ſun's altitude was found 49° 09′ and at 1h. 14′ P.M. per watch, his altitude was found 51° 59′: required the true latitude.

Times. Altit. Natur. D.M.
H.M.S. D.M. Sines. Lat.47.19—0.16880
10.24.00, 49.09—75642, S.dec.12.16—0.01003

1.14.00, 51.59—78783, log. rat. —0.17883

Elap. time —2.50.00 3141 its logar. —3.49707
½Elap. time—1.25.00, its log. in col. of ½ elap. time is 0.44077

0.15.00, in col. of M.T. correſponding to 4.11667

Time at noon 1.10.00 its log. from col. of L. riſing is 3.66542
D° per watch 1.14.00 Log. Ratio 0.17883

Watch faſt —0. 4.00 3066 nat. num. of this log. 3.48659
78783 nat. ſine of greateſt alt.

D.M.
Sun's mer.alt. 54.56 = 81849 nat. ſine of Sun's mer. alt.

Sun's zen.diſt.35. 4
Sun's declin. 12.16 North.

Latitude — 47.20 North.

Here the latitude found by computation may be relied on as the true latitude of the place of obſervation, ſince it differs only one mile from the latitude uſed in the operation.

It is hardly neceſſary to obſerve, that by the ſun's altitude is always meant its correct altitude. See p. 100 for the corrections.

EXAMPLE II.

Being at ſea in 50° 40′ north latitude by account, when the ſun's declination was 20° 00′ ſouth, at 10h. 17′ A.M. per watch, the ſun's altitude was found 17° 13′, and at 11h. 17′ A.M. per watch it was found 19° 41′: required the latitude.

Times Alt. Natur. D.M.
H.M.S. D.M. Sines. Lat.50.40 — 0.19803
10.17.00 17.13=29599 S.dec.20.00 — 0.02701
11.17.00 19.41=33682
Log. rat. — 0.22504
Elap. time — 1.00.00 4083 - - - - — 3.61098
½Elap. time—0.30.00 - - - - - - - - - 0.88430
1. 1.00 - - - - - - - - - 4.72032
Time fr. noon 0.31.00 - - - - - 2.95529
D°. per watch 0.43.00 - - - - - 0.22504
Watch ſlow—0.12.00 538 - - - - 2.73095
33682
D.M.
Natural ſine of Sun's mer. alt.=34220=20.01 = Sun's alt.
69.59 = Sun's Z.D.
20. 0 = Sun's dec.
49.59 lat.

As the latitude, by this computation, differs 41 miles from that by account, it is proper to repeat the operation, uſing the laſt-found latitude inſtead of that by account. D.M.

49.59—0.19178
20.00—0.02701
Log. ratio.—0.21879
3.61098
H.M S. 0.88430
½Elap. time — 0.30.00
1.00.00 - - - - - 4.71407
0.30.00 - - - - - 2.93223
0.43.00 0.21879
Watch ſlow — 0.13.00 517 - - - 2.71344
33682
D.M.
34199=20.00
70.20 = Sun's zen. diſt.
20.00 = Sun's declina.
50.00=lat.

The latitude laſt found, differing only one mile from that uſed in the operation, may be relied on as the true latitude. It is evident that the operation is repeated with very little additional trouble, but few alterations being neceſſary.

EXAMPLE III.

Being at ſea in the latitude of 60° 0′ north by account, when the ſun was in the equator, and, conſequently had no declination, at 1h. 0′ P.M. per watch, his altitude was 28° 53′, and at 3h. 0′ P.M. per watch, it was 20° 42′ : required the true latitude.

			D.M.
	Times.		Lat. 60.00=0.30103
	H.M.S	D M.	Sun's dec. 00.00=0.00000
	1.00.00	28.53=48303	
	3.00.00	20.42=35348	Log. ratio = 0.30103
	2.00.00	12955 - - -	4.11244
½Elap. time —	1.00.00	- - - -	0.58700
	2.00 00		
			5.00047
Time from noon	1.00.00	- - - - -	3.53243
D° per watch —	1 00.00		Log. ratio=0.30103
		1703 - - - - -	3.23140
		48303	
		D.M.	
		50006=30.00=Sun's merid. altit.	
		60.00 latitude.	

Here the latitude by computation comes out the ſame with the latitude by account, which ſhews that the latitude by account was right. From the foregoing examples it is plain that the operation is the ſame, whether the ſun hath north or ſouth declination: and it will be the ſame whether the ſhip is in north or ſouth latitude. It is alſo clear, that when the ſun has no declination, the arithmetical complement of the log. coſine of the latitude is the log. ratio.

Hitherto it has been ſuppoſed that both the altitudes were taken at the ſame place or ſtation : but as that can ſeldom be the caſe at ſea, the neceſſary correction for any alteration of ſtation may be readily made as follows :

Let the bearing of the ſun, at the inſtant of the firſt obſervation, be taken by compaſs (which call Sun's Bearing ☉) and when the ſecond obſervation is taken, find how far the ſhip hath gone, in the time between the obſervations, towards, or farther from, that point of the horizon in which the ſhip was found at the firſt obſervation. This quantity, added to the firſt obſerved altitude, if the ſhip hath moved towards the aforeſaid point, or ſubtracted from the firſt altitude, if the ſhip hath gone farther from the ſaid point, will reduce the firſt altitude to what it would have been found, if obſerved at the ſame ſtation where the ſecond altitude was taken.

Thus ſuppoſe that when the ſun bore SE½E. by compaſs, his altitude was obſerved 18° 27′; and three hours after, it was obſerved 38° 23′ the ſhip in the mean time having gone SE½E. by compaſs at the rate of ſix knots per hour: required what the firſt altitude would have been found, if it had been obſerved at the ſame ſtation with the ſecond altitude.

Here the ſhip's courſe being directly towards that point of the horizon the ſun bore on when the firſt altitude was taken, the whole diſtance run between the obſervations, viz. 18 miles, muſt be added to the firſt altitude, which will bring it to what it would have been found if obſerved at the ſtation where the ſecond altitude was taken. So that the two altitudes for finding the latitude of the laſt ſtation will be 18° 45′ and 38° 23′.

Had the ſhip's courſe been NW½W. or directly from the point that the ſun bore on at the time of the firſt obſervation, in that caſe the 18 miles muſt have been ſubtracted from the firſt obſerved altitude.

When the Ship's courſe makes an acute or obtuſe angle with the Sun's bearing, the diſtance gone towards, or from, that point of the horizon may be readily found by help of the table of difference of latitude and departure.

Thus, ſuppoſe that when the ſun bore SE*b*S. by compaſs, his altitude was 26° 50′; and after ſailing 18 miles on a ſouth courſe by compaſs, his altitude was 37° 10′: required what the firſt altitude would have been, if obſerved at the ſtation where the laſt altitude was taken.

Here the ſhip's courſe making an angle of three points, or 33° 45′ with the ſun's bearing, find in the table of difference of latitude and departure, what the difference of latitude will be, when the courſe is 3 points, and the diſtance 18 miles, and you will have 15 miles to be added to the firſt altitude, the ſhip having gone ſo much towards the point of the horizon that the ſun then bore on. So that the two altitudes to be uſed for finding the latitude of the ſecond ſtation are 27° 05′ and 37° 10′.

Had the ſhip's courſe been north, or three points from the point oppoſite to the ſun's bearing, in that caſe the 15 miles muſt have been ſubtracted from the firſt altitude.

When the ſhip's courſe is at right angles to the ſun's bearing, or eight points from it; in that caſe there is no correction neceſſary.

Example: Suppoſe a ſhip ſailing 7 knots per hour, on an E½S. courſe, by compaſs, at 9h. 55′ 30″ A.M. per watch obſerved the ſun's altitude 17° 33′ bearing S*b*E¼E. by compaſs, and at 0h. 54′ 10″ P.M. per watch obſerved the ſun's altitude 21° 55′: required the latitude of the ſhip when the laſt altitude was taken, the latitude by account being then 47° 34′ north, and the ſun's declination 19° 30′ ſouth.

The ſhip's courſe makes an angle of 6¼ points with the ſun's bearing, and the diſtance run between the obſervations is 21 miles; therefore from the table of difference of latitude and departure, take out the difference of latitude anſwering to that courſe and diſtance, which is 7 miles, to be added to the firſt obſerved altitude, the ſhip having gone ſo much towards the point of the horizon that the ſun then bore on; ſo the two altitudes to be uſed for finding the latitude of the laſt ſtation are 17° 40′ and 21° 55′.

```
                  D.M.
         1ſt alt. 17.33
          Cor.— + 7   Nat.         D.M.
                ----  Sines.   Lat. 47.34—0.17087
        H.M.S. 17.40—30348 S.dec.=19.30—0.02565
        9 55.30 21.55—37326              -------
        0 54.10       -----   Log. ratio 0.19652
        -------        6978     - - -    3.84373
        2.58.40
Elap. time 1.29.20 - - - - - -           0.41945
                                         -------
        0.33.00 - - - - - -              4.45970
        -------                          -------
Time fr. noon 0.56.00 - - - - -          3.47282
D° per watch 0.54.10                     0.19652
        -------                          -------
Watch ſlow   1.50           1889 - - -   3.27630
Natural ſine of greateſt altitude 37326
                                  -----  D.M.
Natural ſine of ſun's merid. alt. 39215=23.05  Sun's M. A.
                                        -----
                                        66.55  Sun's Z. D.
                                        19.30  Sun's Dec.
                                        -----
                                        47.25  Lat.
```

Had the variation of the compaſs been applied both to the ſhip's courſe and ſun's bearing, it would not have made any difference in the operation or reſult, as the angle formed by them will be the ſame, whether they are both eſtimated by compaſs, or when the variation is allowed in both.

CHAP. II.

THE METHOD OF FINDING THE LONGITUDE FROM THE OBSERVATION OF THE ANGULAR DISTANCE BETWEEN THE MOON AND THE SUN OR A FIXED STAR.

IN Chap. vi. ſect. 1. book 1. of the preſent work, the ſeveral methods of diſcovering the longitude are conciſely explained. It was not originally intended to add any thing more to what is already ſaid in that place; but, the opinion of a gentleman whoſe experience and knowledge of the ſubject demands reſpect, has induced the author to annex the preſent chapter.

The angular motion of the moon being very much greater than that of any other celeſtial body, is the cauſe why the obſervation of its place is much better adapted to diſcover ſmall differences of time, than like obſervations made with any other body. The only good practical method of obſerving its place at ſea, is that of meaſuring the angular diſtance between it and the ſun, or a fixed ſtar. This being done, it is plain, if by means of an ephemeris, the time at Greenwich correſponding with the obſerved diſtance be found, the time at the place of obſervation being likewiſe known, that the difference between theſe two times, being turned into degrees and minutes, will give the difference of longitude between Greenwich and the place of obſervation.

The calculations in the ephemeris being ſuppoſed to be accurate, the chief difficulty of this method will conſiſt in finding the corrections neceſſary to be applied to the obſerved diſtance, in order to give the true diſtance as it would appear if obſerved from the center of the earth. For, ſince the altitude of every celeſtial body not in the zenith, is rendered apparently greater by the refractory power of the atmoſphere, (as explained p. 99.) and is likewiſe apparently diminiſhed by the parallax, as we ſhall proceed to ſhew; it can ſcarcely ever happen that the obſerved diſtance ſhall be equal to the true diſtance.

To explain the nature of parallaxes, let EAO, fig. 104. plate 3. repreſent a ſection of the earth, C its center, Z the zenith, O the place of the obſerver, OM the ſenſible horizon, and CH the rational horizon. Let M repreſent the moon apparently in the horizon, and it will be evident, that its real altitude, when beheld from the center C, will be meaſured by the angle MCH. This angle is called the moon's horizontal parallax. Again, let m repreſent the moon above the horizon, but not in the zenith. Its apparent altitude will be meaſured by the angle mOM; but its real altitude from the center C, will be meaſured by the angle mCH. This angle is called the moon's parallax in altitude. Parallax, generally defined, is the angle or arc which meaſures that difference of apparent ſituation of a body in the heavens, which ariſes from a change of ſituation in the obſerver.

If MC=mC be taken as radius, and CP be a perpendicular let fall upon mO continued; CO will be the ſine of the horizontal parallax, and CP will be the ſine of the parallax in altitude. But, if CO be taken as radius, CP will be the ſine of the angle COP=the angle mOZ on the apparent zenith diſtance. Whence it follows, that radius : ſine of apparent zenith diſtance : : ſine of horizontal parallax : ſine of parallax in altitude. And, becauſe the moon's horizontal parallax ſcarcely, when greateſt, exceeds a degree, and the ſines of angles under that quantity do not practically differ from their arcs, it may be ſaid radius : ſine app. zen. diſtance : : hor. parallax : par. in alt.

The very great diſtance of the fixed ſtars renders their parallax abſolutely inſenſible, and the horizontal parallax of the ſun being about $8\frac{2}{3}$ ſeconds, is ſeldom conſidered in practice.

Becauſe the quantities of refraction and parallax depend on the altitude, it is neceſſary, in order to obtain their quantities, that the altitudes of both the heavenly bodies ſhould be taken at the ſame time that their angular diſtance is meaſured. A ſet of obſervations cannot, therefore, be well made by a leſs number than three obſervers.

To

To make the requiſite Obſervations.

Firſt, To find the apparent time at the place of obſervation. This is moſt conveniently done by taking one or more altitudes of the ſun, and noting the time by a good watch. From each obſerved altitude compute the time: the difference between this time and the correſpondent time noted by the watch, will ſhew how much the watch is faſt or ſlow. The mean of ſeveral obſervations, in all caſes where it can be had, is much to be preferred to a ſingle obſervation. The beſt time to take the ſun's altitude for the ſolution of this problem, is when its altitude changes quickeſt; and this is when it bears eaſt or weſt.

Secondly, To make the obſervation of diſtance. The three obſervers being in readineſs, with their quadrants carefully adjuſted, according to the directions given at p. 90; and the watch being either ſuſpended near one of the obſervers, or put into the hands of a fourth perſon appointed to note the time; two of the obſervers muſt take the altitudes, while the third meaſures the diſtance. With reſpect to the altitudes, nothing need be remarked in this place, but that in all caſes the convex or exterior well-defined edge or limb of the moon muſt be brought to the horizon, whether that edge be the upper or lower limb. In meaſuring the diſtance, the moſt obſcure, or leaſt luminous, of the two objects muſt be viewed directly, and the other muſt be brought by reflection into apparent contact with it. In this caſe alſo, the well-defined edge of the moon muſt always be made uſe of for the contact, even though it ſhould be neceſſary, for that purpoſe, to make the reflected image paſs beyond the other. In the night time it will be found advantageous to turn down one or more of the green ſcreens in order to take off the glare of the moon, which would otherwiſe prevent the ſtar from being diſtinctly ſeen. As ſoon as the obſerver of diſtance has ſettled his inſtrument to the required angle, he muſt give notice to his aſſiſtants, who immediately read off the reſpective altitudes from their quadrants, at the ſame inſtant that the fourth obſerver, or one of the three, as previouſly ſettled, notes the time by the watch. Theſe four particulars being written down with expedition, the ſame obſervations are again to be repeated in the ſame manner, and the ſetts reſpectively written beneath the others. After ſix or ſeven ſetts have been made, the mean of the whole muſt be taken, from whence the longitude is to be found by computation.

To make the requiſite Computations.

Problem 1. To find the apparent time from an obſerved altitude of the ſun, the latitude of the place of obſervation being known.

Solution. If the latitude and the ſun's declination be of the ſame name, take the declination from 90°; but if the latitude and ſun's declination be of different names, add the declination to 90°. This difference or ſum is the ſun's polar diſtance.

Find the co-latitude and the ſun's co-altitude.

Add into one ſum, the polar diſtance, co-latitude, and co-altitude. Take half the ſum. Find the difference between the half ſum and the co-altitude.

Add into one ſum, the arithmetical complement of the log. ſine of the polar diſtance, the arithmetical complement of the log. ſine of the co-latitude, the log. ſine of the half ſum, and the log. ſine of the difference. Take half this ſum.

This laſt half ſum is the co ſine of an angle, which being doubled, is the ſun's horary angle. The horary angle turned into time, (ſee p. 106.) is the diſtance of the inſtant of obſervation from noon. If the ſun be riſing, or in the eaſt, take this portion of time from twelve hours; and the remainder is the time of obſervation. But if the ſun be in the weſt, the portion itſelf is the time of obſervation.

EXAMPLE I.

In atitude 44° 12′ N. the altitude of the ſun's lower limb was obſerved, June 17, 1774, in the morning, to be 18° 12′. Time by watch 6 h. 8 m. Height of the eye above the water 28 feet. Required the time and the error of the watch?

Sun's altitude L. l.	18°.12′	
+Semi. diam.—dip. and refrac.	8	
Correct alt.	18. 20	
Co-altitude	71. 40	
Latitude	44° 12′	N.
Co-latitude	45. 48	

June.

June 17, 1774, Sun's declination	23° 25′ N.		
90°—declin.=ſun's polar diſtance	66. 35.		
Polar diſtance	66° 35′	co-ar. ſine	0.03734
Co-latitude	45. 48.	co-ar. ſine	0.14453
Co-altitude	71. 40		
Sum	184. 3		
Half ſum	92. 1	Sine	9 99973
½ Sum—co-altitude	20. 21.	Sine	9.54127
		Sum	19.72287
	43° 23′	co-ſine	9.86143
Doubled	86. 46=horary angle.		

Now 360° : 24h. : : 86° 46′ : 5h. 47′ 4′=diſtance from noon.
And 12h.—5h. 47′ 4″=6h. 12′ 56″=the time.

Time by watch	6h 8′
Time obſerved	6. 12. 56.
Watch ſlow	4. 56.

EXAMPLE II.

In latitude 29° 07′ S. the altitude of the ſun's lower limb was obſerved Auguſt 18, 1780, P.M. to be 23° 10′. Time by watch 3h. 40′. Height of the eye 20 feet. Required the time and the error of the watch?

Sun's altitude l. l.	23° 10′
+Semi. diam.—and dip. and ref.	9
Sun's altitude correct.	23. 19
Co-altitude	66. 41
Latitude	29° 07′ S.
Co-latitude	60. 53

August 18, 1780, ſun's declin. 12° 52′ N.

90° + dec. = ſun's polar diſt. 102. 52

Polar diſ.	102° 52′	co-ar. ſine	0.01104
Co-lat.	60. 53	co-ar. ſine	0.05867
Co-alt.	66. 41		
Sum	230. 26		
½Sum	115. 13	Sine	9.95651
½Sum—co-alt. = diff.	48. 32	Sine	9.87468
		Sum	19.90090
	26° 51′	Co-ſine	9 95045

Doubled 53. 42 = horary angle

Now 360° : 24h. : : 53° 42′ : 3h. 34′ 48″

Time by watch	3h. 40′
Apparent time	3. 34. 48.
Watch faſt	5. 12.

There are a great number of compendiums for obtaining the correct diſtance of the moon from the ſun or a fixed ſtar, when the obſerved diſtance and altitudes of the two bodies are given. The beſt of theſe may be found in the *Tables neceſſary to be uſed with the Nautical Ephemeris*, and in the *Nautical Ephemeris for* 1772. But as the uſual methods by ſpherical trigonometry are nearly as conciſe, and one of them admits of a very accurate ſolution by Gunter's ſcale, it is thought proper to explain that method in this place, in preference to any other.

The three ſides of a ſpherical triangle being given, namely, the diſtance between two heavenly bodies and their zenith diſtances, it is required to find the third ſide when two of the ſides are changed in length, the angle contained between thoſe ſides remaining unaltered. The moſt accurate method in theory of doing this, is to find the angle at the zenith by computation from the obſerved ſides, and afterwards correct the zenith diſtances, and from theſe two corrected ſides and the included angle, find the correct diſtance or third ſide. But the extreme accuracy and rigor required in every part of this computation, renders it too laborious for thoſe who are not practiſed in the nagement of theſe operations. For which reaſon the following method is to be preferred; being equivalent in labour to two azimuths and three amplitudes.

This method which is exemplified here chiefly on account of the facility with which the whole proceſs may be performed on Gunter's ſcale, is not ſtrictly accurate. It is founded on the ſuppoſition, that if a Z (fig. 105. plate 3.) be the apparent zenith diſtance of an heavenly body, AZ its correct zenith diſtance, aB its apparent angular diſtance from another heavenly body B, and AB its correct angular diſtance from the ſame; and a perpendicular Ap be let fall from the real place A upon the apparent diſtance aB, prolonged if neceſſary; the portion ap, or baſe of the right-angled triangle Apa, will be the error or difference between the apparent and true diſtances which ariſes from the error of altitude Aa. This ſuppoſition is very near the truth when the triangle Apa is ſmall. In the preſent inſtance, the inaccuracy of the reſult is ſcarcely ever equal to the errors of obſervation. This inaccuracy is greater the leſs the moon's altitude, the leſs the obſerved diſtance, and the nearer the angle at the moon is to 90°.

PROBLEM II.

The apparent diſtance of the center of the moon from the center of the ſun or a fixed ſtar, together with their reſpective apparent altitudes, to find the correct diſtance as it would appear if beheld from the center of the earth.

Solution. 1. Find the reſpective co-altitudes. Place beneath each other, the apparent diſtance, the ſun or ſtar's co-altitude, and the moon's co-altitude. Find their ſum and half ſum. And alſo the difference between the half-ſum and the ſun or ſtar's co-altitude. Add together the co-ar. log. ſine of the apparent diſtance, the co-ar. log. ſine of the moon's co-altitude, and the log. ſines of the half-ſum and of the difference. Halve this ſum, and the half will be the log. co-ſine of an angle, which being doubled, gives the angle at the moon.

2. Find, as before, the ſum and half-ſum of the apparent diſtance, the moon's co-altitude, and the ſun or ſtar's co-altitude. Find alſo the difference between the half-ſum and the moon's co-altitude. Add together the co-ar. log. ſine of the apparent diſtance, the co-ar. log. ſine of the ſun or ſtar's co-altitude, and the log. ſines of the half-ſum and of the difference. Halve this ſum, and the half will be the log. co-ſine of an angle, which being doubled, gives the angle at the ſun or ſtar.

3. Then ſay, Radius : co-ſine moon's alt. : : [*] horizontal parallax : parallax in altitude. From the parallax in altitude take the refraction (found in table 9.) correſponding to the moon's altitude. The remainder is the error of the moon's altitude.

4. Radius ; co-ſine of angle at the moon : : error of the moon's altitude : firſt error in diſtance. Which is additive to the apparent diſtance, if the angle at the moon be obtuſe, but otherwiſe ſubtractive.

5. Radius : co-ſine of angle at the ſun or ſtar : : refraction correſponding to the ſun or ſtar's altitude : ſecond error in diſtance. Which is additive to the apparent diſtance if the angle at the ſun or ſtar be acute, but otherwiſe ſubtractive.

Solution of the ſame Problem by Gunter's [†] Scale.

1. Find the half-ſum and difference as directed §. 1. of the numeral ſolution. Then ſay,

Radius : ſine apparent diſtance : : ſine moon's zenith diſtance ; fourth ſine.

And fourth ſine : ſine half-ſum : ſine difference : ſine angle. Immediately oppoſite to which, on the line of verſed ſines, is the angle at the moon.

2 Find the half-ſum and difference as directed §. 2. of the numeral ſolution. Then ſay,

Radius : ſine apparent diſtance : : ſine ſun or ſtar's zenith diſtance : fourth ſine.

And fourth ſine : ſine half-ſum : : ſine half difference : ſine angle. Immediately oppoſite to which, on the line of verſed ſines, is the angle at the ſun or ſtar.

3. The other proportions are given in §§ 3, 4, 5, of the numeral ſolution.

From the Correct Diſtance to find the Longitude of the Place of Obſervation.

Seek, in the Nautical Ephemeris, on the day of the month, for the two computed diſtances neareſt the diſtance obſerved.

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[*] The moon's horizontal parallax is found in the Nantical Ephemeris againſt the day of the month. Every other element uſed in this computation, beſides the obſerved angles, ought to be taken from that work.

It is convenient in theſe ſmall angles of parallax or refraction, to turn the ſeconds into decimal parts of minutes by the analogy. As 60 ſec. : 1 min. : : the given number of ſeconds, with one or more decimal cyphers adjoined : the decimal required.

[†] The Gunter's Scale beſt adapted for the ſolution of this and moſt other problems, is made by Nairne and Blunt, in Cornhill, London. This ſcale has a ſlider, and is equivalent to a table of logarithms carried to three places of figures beſides the index.

Find the difference between the two computed diſtances, which call the firſt difference. Find alſo the difference between the earlieſt of the two computed diſtances and the correct obſerved diſtance, which call the ſecond difference. Then ſay, As the firſt difference : ſecond difference : : 3 hours : a portion of time. Which added to the time of the firſt of the two computed diſtances gives the apparent time at Greenwich. The difference between this time and the time by watch being turned into degrees and minutes, is the difference of longitude. If the time at Greenwich preceeds or is earlier than the obſerved time, the longitude is eaſt, if otherwiſe weſt.

† EXAMPLE I.

Suppoſe the following obſervations to been taken at ſea, in latitude 34° 17′ N. and longitude by dead-reckoning 13° 56′ weſt of Greenwich. Height of the eye 18 feet. It is required to compute the longitude from thence.

April 4, 1767. Times by watch. h. m. s.	Diſtance obſerved ☉ & ☽ nearer limbs.	Obſerved altitudes of ☉'s lower limb from horizon of the ſea.	Obſerved altitudes ☽'s lower limb from horizon of the ſea.
4. 47. 14.	73° 41′ 53″	22° 50′	80° 17′
4. 50. 11.	73. 43. 55.	22. 12.	80. 36.
4. 55. 26.	73. 47. 33.	21. 6.	81. 9.
S. 14. 32. 51.	221. 13. 21.	66. 8.	242. 2.
M. 4. 50. 57.	73. 44. 27.	22. 3.	80. 41.

The going of the watch muſt be aſcertained from the computation of the time from one or more altitudes of the ſun, according to problem 1. of this chapter. By ſuch an obſervation we here ſuppoſe it to be known, that the watch is 22 m. 38 ſec. too faſt. Therefore, 4h. 50′ 57″—22′ 38″ gives 4h. 28′ 19″ the apparent time of the obſervation.

Previous to the actual computation for clearing the diſtance, it will be neceſſary to reduce the ſeveral obſervations to the centers of the ſun and moon. Seek in the Ephemeris for the ſemi-diameters of the ſun and moon for the time of obſervation. The ſemi-diameter of the ſun is found to be 16′ 1″, and that of the moon, for noon at Greenwich, is $15' \, 22''$, and for midnight $15' \, 16''$. Now the difference of time equivalent to $13^\circ \, 56'$ weſt of Greenwich, is about an hour; which added to the obſerved time $4\frac{1}{2}$ hours, makes $5\frac{1}{2}$ hours for the time roughly eſtimated for Greenwich. The difference of the moon's ſemi-diameter for 12 hours, is $6''$; therefore, $12\text{h.} : 6'' :: 5\frac{1}{2}\text{h.} : 2\frac{3}{4}''$. Which, as the ſemi-diameter is decreaſing, muſt be taken from $15' \, 22''$, and leaves $15' \, 19\frac{1}{4}''$ for the moon's ſemi-diameter at the time of obſervation.

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† Aſtronomical time, in which the day is divided into hours, counted from 0 to 24, beginning at noon, is uſed in theſe examples.

This is the moon's ſemi-diameter as ſeen from the center of the earth. But it is evident from the contemplation of fig. 104, plate 3. that the moon is nearer the obſerver at O the greater its altitude, the line Om being leſs than OM, its ſemi-diameter muſt, therefore, be greater at the ſame time. The particle to be added at the ſeveral altitudes is given in the note *. To $15' \, 19\frac{1}{4}''$ add $16''$ for the increaſe ariſing from the moon's altitude, and the correct ſemi-diameter, rejecting the $\frac{1}{4}''$ will be $15' \, 35''$.

To bring the obſerved diſtance of the nearer limbs of the ſun and moon to the apparent diſtance of their centers, the ſemi-diameter of each luminary muſt be added. That is $73^\circ \, 44' \, 27'' + 16' \, 1'' + 15' \, 35'' = 74^\circ \, 16' \, 3''$ = the apparent diſtance of the ſun and moon's centers.

To find the apparent altitude of the ſun's center, the lower limb being uſed, the ſemi-diameter muſt be added, and the dip. of the horizon ſubtracted. That is $22^\circ \, 3' + 16' - 4' = 22^\circ \, 15'$ = the apparent altitude of the ſun; it not being neceſſary in the altitudes to proceed to ſeconds.

To find the apparent altitude of the moon, the lower limb being uſed, the ſemi-diameter muſt be added, and the dip. ſubtracted. That is, $80^\circ \, 41' + 16' - 4' = 80^\circ \, 53'$ = the app. alt. of the moon.

In like manner as the moon's ſemi-diameter was found for the time of obſervation, ſo alſo muſt the horizontal parallax. Now the horizontal parallax at noon is $56' \, 24''$, and at midnight $56' \, 1''$, the difference being $23''$. Therefore, $12\text{h.} : 23^\circ :: 5\frac{1}{2}' : 11''$, which, ſubtracted from $56' \, '4''$, becauſe the parallax is decreaſing, leaves $56' \, 13''$ for the horizontal parallax at the time of obſervation. This expreſſed in minutes and decimal parts is $56'.217$.

With

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* ☽'s altitudes.	5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°	75° & above
Inc. of ☽'s ſemi-diam.	1″	3″	4″	6″	7″	8″	9″	10″	11″	12″	13″	14″	15″	15″	16″

With theſe data we proceed to compute according to the problem.

Sun's app. alt.	22°15′
Co-alt.	67.45
Moon's app. alt.	80.53
Co-alt.	9.07

Ap. dif.	74° 16′	co-ar. ſine	0.01658
Moon's co-alt.	9. 07	co-ar. ſine	0.80012
Sun's co-alt.	67. 45		
Sum	151. 08		
Half	75. 34	Sine	9.98607
Differ.	7. 49	Sine	9.13355
			19.93632
	21° 40′	co-ſine	9.96816

Doubled 43. 20=angle at the moon.

Ap. dif.	74° 16′	co-ar. ſine	0.01658
Sun's co-alt.	67. 45	co-ar. ſine	0.03360
Moon's co-alt.	9. 07		
Sum	151. 08		
Half	75. 34	Sine	9.98607
Differ.	66. 27	Sine	9.96223
			19.99848
	3° 23′	co-ſine	9.96924

Doubled 6. 46=angle at the ſun

Radius

Radius - - - - -		10.
: Co-ſine ☽ alt.	80° 53′	9.19988
: : Hor. paral.	56′.217	1.74987
: Par. in alt.	8′.91	0.94975
Sub. ref. 9′=.15′	.15	
Error of ☽ alt.	8. 76	

Radius - - - - -		10.
; Co-ſi. angle at ☽	43° 20′	9.86176
: : Error of ☽ alt.	8′.76	0.94250
: Error in diſ.	6′.37	0.80426

Which is ſubtractive.

Radius - - - - -		10.
: Co-ſi. angle at ſun 6° 46′		9.99696
: : Refrac. cor. to alt. 2′ 20″=2′333		0.36791
: Second error in diſ. =	2′.317	0.36487

Which is additive.

Now 6′ .37=6′ 22″ 12‴ and 2′ 317=2′ 19″

Whence app. diſ. 74° 16′ 3″—6′ 22″ 12‴+2′ 19″=74° 11′ 59″ 48‴=correct diſtance.

By Mr. Lyons' Compendium the correct diſt. comes out 74° 11′ 58″, and by Mr. Dunthorne's Compendium it is 74° 11′59″. See Tables requiſite to be uſed with the Nautical Ephemeris, p. 159.

The ſame Example ſolved by Gunter's Scale.

The preparative work being done, and the half ſums and differences found, as directed §§ 1, 2. of the numeral ſolution. Then ſay,

Radius : ſine 74° 16′ : : ſine 9° 07′ : ſine 8° 46′.

Sine 8° 46′ : ſine 75° 34′ : : ſine 7° 49′ : a ſine oppoſite to which, on the line of verſed ſines, ſtands 43½°=the angle at the moon.

Now,

Radius : ſine 9° 07′ : : 56′ 22 : 8′ 9=Par. in alt. From which take .15′ refrac. and the remainder 8′ 75 is the error of the moon's altitude.

Again,

Radius : ſine 74° 16′ : : ſine 67° 45′ : ſine 62° 50′.

Sine 62° 50′ : ſine 75° 34′ : : ſine 66° 27′ : a ſine oppoſite to which, on the line of verſed ſines, ſtands a point which is ſomewhat to the left of the half diviſion of the ſpace between the beginning of the line and the diviſion of 10°. We may therefore call it 6°=the angle at the ſun.

And,

Radius : co-ſine 43½=ſine 46½ : : error of ☽ alt. 8′ 75 : Firſt error of diſt. 6′ 33=6′ 19″ 48‴.

Radius : co-ſine 6°=ſine 84 : refract. in alt. ☉ 2′ 33 : Second error of diſt. 2′ 32=2′ 19″ 12‴.

Laſtly, 74° 16′ 3″—6′ 19″ 48‴+2′ 19″ 12‴=74° 12′ 02″ 24‴=correct diſtance.

The correct diſtance 74° 11′ 59″ 48‴, may be called 74° 12′ becauſe the 48‴ may be taken as a whole ſecond. Therefore,

Diſtance by Ephem. at 3 hours 73° 1′ 27″
at 6 hours 74. 28. 50
Obſerved diſt. 74. 12. 00

Firſt diff. 1. 27. 23

Second diff. 1. 10. 33

* Now, 1° 27′ 23″ : 1° 10′ 33″ : : 3h. : 2h. 25′ 19″, which added to 3 h. gives 5h. 25′ 19″=time at Greenwich.

Time at Greenwich 5h. 25′ 19″
Time at Ship 4. 28. 19

Difference of time 57. 00 gives 14° 15′ longitude, which is weſt, becauſe the time at Greenwich does not proceed the time at the ſhip.

If the diſtance as given by Gunter's ſcale be uſed, the longitude will come out 14° 16′ weſt.

The longitude thus found, is the longitude of the place at which the altitude was taken for regulating the watch. For the watch being ſuppoſed to go true during the interval between the taking of the altitude and the obſervation of diſtance, ſhews the time at the place at which the altitude was taken.

If

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* Proportions in which all the three terms are ſexageſimals, are compendiouſly worked by the table of proportional logarithms. See Tables requiſite to be uſed with the Aſtronomical and Nautical Ephemeris, p. 137.

If the ſun riſes or falls quick during the obſervation of diſtance it will be convenient to compute the time directly from the mean altitude.

EXAMPLE II.

In latitude 17° 30′ S. and longitude by account 64° 32′ E. of Greenwich, ſuppoſe the following obſervations to be made. It is required to determine the longitude of the place from thence.

Sep. 5. 1767. For rectifying the watch, obſerved at 4h. 59′ 32″ per watch, the altitude of the ſun's lower limb above the horizon of the ſea = 10° 29′. The height of the eye being 12 feet.

After which the diſtance between the moon and α pegaſi was obſerved as hereunder.

	Time by watch.	Obſerved diſt. moon's remoteſt limb from α pegaſi.	Apparent alt. moon's lo. limb above the horizon of the ſea.	Ap. alt. ✳ above the horizon of the ſea.
	14h. 50′ 30″	44° 53′ 48″	15° 22′	35° 22′
	14. 55. 35	44. 50. 49	14. 11	34. 15
	15. 00. 00	44. 48. 14	13. 8	33. 17
	15. 05. 50	44. 44. 48	11. 46	32. 1
	15. 11. 15	44. 41. 37	10. 30	30. 50
S.	75. 3. 10	223. 59. 16	64. 57	165. 45
M.	15. 0. 38	44. 47. 51	12. 59	33. 9

To Compute the Time for rectifying the Watch according to Problem I.

Sun's alt. l. l.	10° 29′
+ Semi-diam. — dip. and refrac.	8
Correct alt.	10. 37
Co-alt.	79. 23
Latitude	17° 30′ S.
Co-latitude	72. 30

Polar

The time at Greenwich preceeds that of the ſhip, becauſe the ſhip's longitude is eaſt. Turn, therefore, the longitude 64° 32′ into time, and it will give 4h. 18′ 8″, which taken from 4° 59′ 32″, leaves 41′ 24″ for the Greenwich time of the obſervation nearly. Now the difference between the ſun's declination for Sep. 5, 1767, at noon, and the declination for the noon of the following day is 22′ 21″ decreaſing. Therefore 24h. : 22′ 21″ : : 41½′ : 36″, which taken from 6° 50′ 10″ N. = the ſun's declination at noon, leaves 6° 49′ 34″ N. for the ſun's declination at the time of obſerving. And becauſe the 34″ exceeds the half minute, and we do not require the declination nearer than to minutes we may call it 6° 50′ N.

Sun's declination 6° 50′ N. + 90° = 96° 50′ = polar diſtance.

Polar diſt.	96.50	co. ar. S.	0.00310
Co-lat.	72.30	co. ar. S.	0.02058
Co-alt.	79.23		
	248.43		
	124.31	Sine —	9.91677
	44.58	Sine —	9.84923
			19.78968
	38.17	Co-ſine	9.89484

76.34 = horary angle

Now 36° : 24h : : 76° 34′ : 5h. 6′ 17″ = the time.

Time by watch 4. 59. 32

Watch ſlow .6. 44

To

To Compute from the Observations of Distance according to Problem X.

Time by watch	15h. 0′ 38″
Watch slow	6. 44
App. time of obſ.	15. 7. 22
* Alt. obſerved	33. 9
—Dip.	3
*’s ap. alt.	33. 6
Co-altitude	56. 54
☽’s alt. obſerved L. L.	12. 59
+ Semi. diam.—and dip.	13
☽’s app. alt.	13. 12
Co-altitude	76. 48
☽’s hor. par. at noon	60′ 11″
——— at midnight	60. 34
Diff. increaſing	23

12h. : 23″ : : 10h. 49′ : 21″

And 60′ 11″+21″=60′ 32″=60′.533=hor. par. at the time of obſervation.

Diff. long. ſuppoſed 64° 32′ or time	4h. 18′ 8″
Taken from app. time of obſ.	15. 7. 22
Leaves Greenwich time of obſ. nearly	10. 49. 14

☽’s ſemi-diam. at noon	16′ 24″
——— at midnight	16. 30
Difference increaſing	6″

12h. : 6″ :: 10h. 49′ : 5½″=increaſe of ☽ ſemi-diam. Therefore 16′ 24″+5½=16′ 29½″=☽'s ſemi-diam. at the time of obſervation. To which add 3½″ for the increaſe ariſing from the altitude, and the ☽'s apparent ſemi-diameter will be 16′ 33″.

Obſ. diſt. ☽'s remote limb and *			44° 47′ 51″
— ☽'s ſemi-diam.			16. 33
App. diſ. ☽'s center and * =			44. 31. 18
Ap. diſ.	44° 31′	co. ar. S.	0.15421
☽'s co-alt.	76. 48	co. ar. S.	0.01163
*'s co-alt.	56. 54		
	178. 13		
	89. 6	Sine	9.99994
	32. 12	Sine	9.72662
			19.89240
	27° 56′	co. S.	9.94620
Angle at ☽ =55. 52			
Ap. diſ.	44.31	co. ar. S.	0.15421
* co-alt.	56.54	co. ar. S.	0.07690
☽'s co-alt.	76.48		
	178.13		
	89. 6	Sine	9.99994
	12.18	Sine	9.32844
			19.55949
	52° 58′	co. S.	9.77974
Angle at * =105. 56			

Radius

Radius - - - -		10.
: Co-ſ. ☽'s alt.	13° 12′	9.98837
: : Horiz. parallax	60′.533	1.78199
: Par. in alt.	58′.93	1.77036
Sub. ref. 3′ 57″ =	3′.95	
Error of ☽'s alt.	54 .98	

Radius - - - -		10.
: Co-ſ. angle at ☽	55° 52′	9.74906
: : Error in ☽'s alt.	54′.98	1.74020
: Error in diſtance	30′.85	1.48926

Which is ſubtractive.

Radius - -		10.
: Co-ſ. angle at ✱	105° 56′	9.43857
: : Ref. cor. to ✱ alt. 1′28″=1′.467		0.16643
: Error in diſtance	.403	1.60500

Which is ſubtractive.

Now 30′.85=30′ 51″ and .′403=24″ 12‴

Whence app. diſt. 44° 31′ 18″—30′ 51″—24″ 12‴=44° 0′ 2″ 48‴ or 44° 0′ 3″=cor. diſt. By Mr. Lyons' compendium, the correct diſtance comes out 44° 0′ 21″. By Mr. Dunthorne's, it is 44° 0′ 23″. And by the ſtricteſt computation by ſpherical trigonometry, it is 44° 0′ 23″ 16‴.

The ſame Example ſolved by Gunter's Scale.

Rad. : ſine 44° 31′ : : ſine 76° 48′ : ſine 43°.

Sine 43° : ſine 89° 6′ : : ſine 32° 12′ : a ſine oppoſite to which on the verſed ſines, ſtands 55¾°=angle at ☽.

Again,

Rad. : ſine 44° 31′ : : ſine 56° 54′ : 35° 50′.

Sine 35° 50′ : ſine 89° 6′ : : ſine 12° 18′ : a ſine oppoſite to which on the verſed ſines, ſtands 105° 50′=angle at ✱.

Now,

Rad. : co-ſine 13° 12′=ſine 76° 48′ : : hor. par. 60′ 533 : par. in alt. 59′, from which take 3′.95 refraction, and the remainder 55′ .05 is the error of the moon's alt.

And,

Rad. : co-ſine 55° 52′=ſine 34° 08 : : error in ☽'s alt. 55° 05′ : Firſt error of diſt 30′.86=30′ 51″ 36‴.

Rad. : co-ſine 105° 56′=ſine 15° 56′ : : refrac in *'s alt. 1′ 467 : ſecond error of diſt. 4′ 02=24″ 12‴.

Laſtly, 44 31′ 18″—30′ 51″ 36‴—24″ 12‴=44° 0′ 2″ 12‴=correct diſtance.

From the Correct Diſtance to find the Longitude.

Diſtance by ephemeris	at 9 hours	45° 6′ 40″
	at 12 hours	43. 24. 24
Obſerved diſtance		44. 0 3
	Firſt diff.	1. 42. 16
	Second diff.	1. 6. 37

Now 1° 42′ 16″ : 1° 6′ 37″ : : 3h. : 1h. 57′ 15″, which added to 9h. gives 10h. 57′ 15″=time at Greenwich.

Time at Greenwich	10h. 57′ 15″
Time at ſhip	15. 7. 22
Diff. of time	4. 10. 07

Diff. of time 4. 10. 07 gives 62° 31′ 45″ longitude, which is eaſt, becauſe the time at Greenwich precedes that of the ſhip.

If the diſtance as given by Gunter's ſcale, be uſed, the longitude will come out 62° 31′ 30″, and if the diſtance 44° 0′ 23″, as found by ſpherical trigonometry, be uſed, the true longitude is found to be 62° 41′. The difference 9′ 15″ ariſes from the magnitude of the moon's parallax, and the ſhortneſs of the diſtance, which, as already obſerved, render this method of ſolution not ſo accurate as in caſes where they are leſs conſiderable.

TABLE

And,

Rad. : co-ſine 55° 52′=ſine 34° 08 : : error in ☽'s alt. 55° 05′ : Firſt error of diſt 30′.86=30′ 51″ 36‴.

Rad. : co-ſine 105° 56′=ſine 15° 56′ : : refrac in ✱'s alt. 1′ 467 : ſecond error of diſt. 4′ 02=24″ 12‴.

Laſtly, 44 31′ 18″—30′ 51″ 36‴—24″ 12‴=44° 0′ 2″ 12‴=correct diſtance.

From the Correct Diſtance to find the Longitude.

Diſtance by ephemeris at 9 hours	45° 6′ 40″
at 12 hours	43. 24. 24
Obſerved diſtance	44. 0 3
Firſt diff.	1. 42. 16
Second diff.	1. 6. 37

Now 1° 42′ 16″ : 1° 6′ 37″ : : 3h. : 1h. 57′ 15″, which added to 9h. gives 10h. 57′ 15″=time at Greenwich.

Time at Greenwich	10h. 57′ 15″
Time at ſhip	15. 7. 22
Diff. of time	4. 10. 07 gives 62° 31′ 45″

longitude, which is eaſt, becauſe the time at Greenwich precedes that of the ſhip.

If the diſtance as given by Gunter's ſcale, be uſed, the longitude will come out 62° 31′ 30″, and if the diſtance 44° 0′ 23″, as found by ſpherical trigonometry, be uſed, the true longitude is found to be 62° 41′. The difference 9′ 15″ ariſes from the magnitude of the moon's parallax, and the ſhortneſs of the diſtance, which, as already obſerved, render this method of ſolution not ſo accurate as in caſes where they are leſs conſiderable.

TABLE I. A Table of Logarithms from 1 to 10,000.

No.	0	1	2	3	4	5	6	7	8	9
100	00000	00043	00087	00130	00173	00217	00261	00303	00346	00389
101	00432	00475	00518	00561	00604	00647	00689	00732	00775	00817
102	00860	00903	00945	00988	0103	01072	01115	01157	01199	01242
103	01284	01326	01368	01410	01452	01494	01536	01578	01620	01661
104	01703	01745	01787	01828	01870	01912	01953	01995	02036	02077
105	02119	02160	02202	02243	02284	02325	02366	02407	02449	02490
106	02531	02571	02612	02653	02694	02735	02776	02816	02857	02898
107	02938	02979	03019	03060	03100	03141	03181	03222	03262	03302
108	03342	03383	03423	03463	03503	03543	03583	03623	03663	03703
109	03743	03782	03822	03862	03902	03941	03981	04021	04060	04100
110	04139	04179	04218	04257	04297	04336	04375	04415	04454	04493
111	04532	04571	04610	04649	04688	04727	04766	04805	04844	04883
112	04922	04961	04999	05038	05077	05115	05154	05192	05231	05269
113	05308	05346	05385	05423	05461	05500	05538	05576	05614	05652
114	05690	05729	05767	05805	05843	05880	05918	05956	05994	06032
115	06070	06108	06145	06183	06221	06258	06296	06333	06371	06408
116	06446	06483	06521	06558	06595	06633	06670	06707	06744	06781
117	06819	06856	06893	06930	06967	07004	07041	07078	07114	07151
118	07188	07225	07262	07298	07335	07372	07408	07445	07482	07518
119	07555	07591	07628	07664	07700	07737	07773	07809	07846	07882
120	07918	07954	07990	08027	08063	08099	08135	08171	08207	08243
121	08278	08314	09350	08386	08422	08458	08493	08529	08565	08600
122	08636	08672	08707	08743	08788	08814	08849	08884	08920	08955
123	08990	09026	09061	09096	09131	09167	09202	09237	09272	09307
124	09342	09377	09412	09447	09482	09517	09552	09587	09621	09656
125	09691	09726	09760	09795	09830	09864	09899	09933	09968	10003
126	10037	10071	10106	10140	10175	10209	10243	10278	10312	10346
127	10380	10414	10549	10483	10517	10551	10585	10619	10653	10687
128	10721	10755	10789	10823	10856	10890	10924	10958	10992	11025
129	11059	11093	11126	11160	11193	11227	11260	11294	11327	11361
130	11394	11428	11461	11404	11528	11561	11594	11661	11661	11694
131	11727	11760	11793	11826	11809	11893	11926	11959	11991	12024
132	12057	12090	12123	12156	12189	12222	12254	12287	12320	12352
133	12385	12418	12450	12483	12516	12448	12581	12613	12646	12678
134	12710	12743	12775	12808	12840	12872	12904	13936	12969	13001
135	13033	13065	13098	13130	13162	13194	13226	13258	13290	13322
136	13354	13380	13418	13450	13481	13513	13545	13577	13609	13640
137	13672	13704	13735	13767	13799	13830	13862	23893	13925	13956
138	13988	14019	14051	14082	14114	13145	14176	14208	14239	14270
139	14301	14333	14364	14395	14426	14457	14488	14520	14551	14582
140	14613	14644	14675	14706	14737	14798	14798	14829	14860	14891
141	14922	14953	14983	15014	15045	15076	15106	15137	15168	15198
142	15229	15259	15290	15320	15351	15381	15412	15442	15473	15503
143	15534	15564	15594	15625	15655	15685	15715	15746	15776	15806
144	15830	15866	15896	15927	15957	15987	16017	16047	16077	16107
145	16137	16167	16197	16227	16256	16286	16316	16346	16376	16405
146	16435	16465	16495	16524	16554	16584	16613	16643	16673	16702
147	16732	16761	16791	16820	16850	16879	16909	16938	16967	16997
148	17026	17055	17085	17114	17143	37173	17202	17231	17260	17289
149	17319	17348	17377	17406	17435	17464	17493	17522	17551	17580
150	17609	17638	17067	17696	17725	17754	17782	17811	17840	17869
151	17898	17926	17955	17984	18013	18041	18070	18099	18127	18156
152	18184	18213	18241	18270	18298	18327	18355	18384	18412	18441
153	18469	18497	18526	18554	18583	18611	18639	18667	18696	18724
154	18752	18780	18808	18837	18865	18893	18921	18949	18977	19005
155	19033	19061	19089	19117	19145	19173	19201	19229	19257	19285
156	19312	19340	19368	19396	19424	19451	19479	19507	19535	19562
157	19590	19618	19645	19673	19700	19728	19756	19783	19811	19838
158	19866	19893	19921	19948	19975	20003	20030	20058	20085	20112
159	20140	20167	20194	20222	20249	20270	20303	20330	20358	20285

A Table of Logarithms from 1 to 10,000.

No	0	1	2	3	4	5	6	7	8	9
160	20412	20439	20466	20493	20520	20547	20574	20602	20629	20656
161	20683	20709	20736	20763	20790	20817	20844	20871	20898	20925
162	20951	20978	21005	21032	21059	21085	21112	21139	21165	21192
163	21219	21245	21272	31299	21325	21352	21378	21405	21431	21458
164	21484	21511	21537	21564	21590	21617	21643	21669	21696	21722
165	21748	21775	21801	21827	21853	21886	21906	21932	21958	21985
166	22011	22037	22063	22089	22115	22141	22167	22194	22220	22246
167	22272	22298	22324	22350	22375	22401	22427	22453	22479	22505
168	22531	22555	22583	22608	22634	22660	22686	22711	22737	22763
169	22789	22814	22840	22866	22891	22917	22943	22968	22994	23019
170	23045	23070	23096	23121	23147	23172	23198	23223	23249	23274
171	23300	23325	23350	23376	23401	23426	23452	23477	23502	23528
172	23553	23578	23603	23628	23654	23679	23704	23729	23754	23776
173	23805	23830	23855	23880	23905	23930	23955	23980	24005	24030
174	24055	24080	24105	24130	24155	24179	24204	24229	24254	24279
175	24304	24329	24353	24378	24403	24428	24452	24477	24502	24527
176	24551	24576	24601	24625	24650	24674	24699	24724	24748	24773
177	24797	24822	24846	24871	24895	24920	24944	24969	24993	25018
178	25042	25066	25091	25115	25139	25164	25188	25212	25237	25261
179	25285	25310	25334	25558	25382	25406	25431	25455	25479	25503
180	25527	25551	25575	25600	25624	25648	25672	25696	25720	25744
181	25768	25792	25816	25840	25864	25888	25912	25935	25959	25983
182	26007	26031	26055	26079	26102	26126	26150	26174	26198	26221
183	26245	26269	26292	26316	26340	26364	26387	26411	26434	26458
184	26482	26505	26529	26552	26576	26600	26623	26647	26670	26694
185	26717	26741	26764	26787	26811	26834	26858	26881	26905	26928
186	26951	26975	26998	27021	27045	27068	27091	27114	27138	27161
187	27184	27207	27231	27154	27277	27300	27323	27347	27370	27393
188	27416	27439	27462	27485	27508	27531	27554	27577	27600	27693
189	27646	27669	27692	27715	27738	27761	27784	27807	27830	27832
190	27875	27898	27921	27944	27967	27989	28012	28035	28058	28081
191	28103	28126	28149	28171	28194	28217	28239	28262	28285	28307
192	28330	28353	28375	28398	28420	28443	28460	28488	28511	28533
193	28556	28578	28601	28623	28646	28668	28690	28713	28735	28758
194	28780	28802	28825	28847	28870	28892	28914	28937	28959	28981
195	29003	29026	29048	29070	29092	29115	29137	29159	29181	29203
196	29226	29248	29270	29292	29314	29336	29358	29380	29402	29425
197	29447	29469	29491	29513	29535	29557	29570	29601	29623	29645
198	29666	29688	29710	29732	29754	29776	29798	29820	29842	29863
199	29885	29907	29929	29951	29972	29994	30016	30338	30059	30081
200	30103	30125	30146	30168	30190	30211	30233	30255	30276	30298
201	30320	30341	30363	30384	30406	30427	30449	30471	30492	30514
202	30535	30556	30578	30600	30621	30642	30664	30685	30707	30728
203	30750	30771	30792	30814	30835	30856	30878	30899	30920	30942
204	30963	30984	31006	31027	31048	31069	31091	31112	31130	31154
205	31175	31197	31218	31239	31260	31281	31302	31323	31344	31366
206	31387	31408	31429	31450	31471	31492	31513	31534	31555	31576
207	31597	31618	31639	31660	31681	31702	31723	31744	31764	31785
208	31806	31827	31848	31869	31890	31911	31031	31952	31973	31994
209	32015	320[illegible]	32056	32076	32098	32118	32130	32160	32180	32201
210	32222	32243	32203	32284	32305	32325	32346	3236	32387	32408
211	32428	32419	32469	32490	32510	32531	32552	32572	32593	32613
212	32634	62654	32674	32695	32715	32736	32756	32777	32797	32818
213	32838	32868	32879	32899	32919	32940	32960	32980	33001	33021
214	33041	33052	33082	33102	33122	33143	33163	33185	33203	33224
215	33244	33264	33284	33304	33325	33345	33365	33385	33405	33425
216	53415	33465	334 6	33506	33526	33546	33566	33586	33606	33626
217	33646	33666	33686	33706	33726	33746	33766	33786	33806	33826
218	33846	33866	33885	33905	33925	33945	33963	33985	34005	34025
219	34044	34064	34084	34104	34124	34143	34163	34183	34205	34322

A Table of Logarithms from 1 to 10,000.

N°.	0	1	2	3	4	5	6	7	8	9
220	34242	34262	34282	34301	34321	34341	34360	34380	34400	34420
221	34439	34459	34478	34498	34518	34537	34557	34577	34596	34616
222	34635	34655	34674	34694	34713	34733	34752	34772	34791	34811
223	34830	34850	34869	34889	34908	34928	34947	34967	34986	35005
224	35025	35054	35064	35082	35102	35122	35141	35160	35180	35199
225	35218	35237	35257	35276	35295	35315	35334	35353	35372	35392
226	35411	35430	35449	35468	35488	35507	35526	35545	35564	35583
227	35603	35622	35641	35660	35679	35698	35717	35736	35755	35774
228	35793	35812	35832	35851	35870	35889	35908	35927	35946	35965
229	35983	36002	36021	36040	36056	36078	36097	36116	36135	36153
230	36173	36192	36210	36229	36248	36267	36286	36305	36324	36342
231	36361	36380	36399	36418	36436	36455	36474	36493	36511	36530
232	36549	36567	36586	36605	36624	36642	36661	36680	36698	36717
233	36736	36754	36773	36791	36810	36829	36847	36866	36884	36903
234	36922	36940	36959	36977	36996	37014	37033	37051	37070	37088
235	37107	37125	37104	37162	37181	37199	37217	37236	37254	37273
236	37291	37310	37328	37346	37365	37383	37401	37420	37438	37456
237	37475	37493	37511	37530	37548	37566	37585	37603	37621	37639
238	37658	37676	37694	37712	37731	37749	37767	37785	37893	37822
239	37840	37858	37876	37894	37912	37930	37949	37967	37985	38003
240	38021	38039	38057	38075	38093	38111	38330	38148	38166	38184
241	38202	38220	38238	38256	38274	38292	38310	38328	38346	38364
242	38381	38399	38317	38435	38453	38471	38489	38507	38525	38543
243	38561	38578	38596	38614	38632	38650	38668	58685	38703	38721
244	38739	38757	38775	38792	38810	38828	38846	38863	38881	38899
245	38917	38934	38952	38970	38987	39005	39023	39040	39058	39076
246	39093	39111	39129	59146	39164	39182	39199	39217	39234	39252
247	39230	39287	39305	39322	39340	39357	39375	39393	39410	39428
248	39445	39463	39480	39500	39515	39533	39550	39568	39585	39602
249	39620	39637	39655	39672	39690	39707	39724	39742	39759	39777
250	39794	39815	39829	39846	39863	39881	39898	39915	39933	39950
251	39967	39985	40002	40019	40036	40054	40071	40088	40106	40133
252	40140	40157	40174	40192	40209	40226	40243	40260	40278	40295
253	40312	40329	40346	40363	40381	40398	40415	40432	40449	40466
254	40483	40500	40517	40535	40552	40569	40586	40603	40620	40637
255	40653	40671	40688	40705	40722	40739	40756	40773	40790	40807
256	40824	40841	40858	40875	40892	40909	40926	40243	40959	40976
257	40993	41010	41027	41044	41061	41078	41095	41111	41128	41145
258	41162	41179	41196	41212	41229	41246	41263	41280	41296	41313
259	41330	41347	41363	41380	41397	41414	41430	41447	41464	41481
260	41497	41514	41531	41547	41564	41581	41597	41614	41631	41647
261	41664	41681	41697	41714	41731	41747	41764	41780	41797	41813
262	41830	41847	41863	41880	41896	41913	41929	41946	41962	41979
263	41996	42012	42029	42045	42062	42078	42094	42111	42123	42144
264	42160	42177	42193	42210	42226	42243	42256	42275	42292	42303
265	42325	42341	42357	42374	42390	42406	42423	42431	42455	42472
266	42488	42504	42521	42537	42553	42570	42586	42602	42619	42635
267	42651	42667	42684	42700	42716	42732	42749	42765	42781	42797
268	42813	42830	42846	42862	42878	42894	42911	42927	42943	42959
269	42975	42991	43007	43024	43040	43050	43072	43088	43104	43120
270	43136	43152	43168	43185	43201	43217	43233	43249	43265	43281
271	43297	43313	43329	43345	43361	43377	43393	43409	43425	43441
272	43457	43473	43489	43505	43521	43537	43553	43568	43584	43600
273	43616	43632	43648	43664	43680	43696	43712	43727	43743	43759
274	43775	43791	43807	43823	43838	43854	43879	43886	43902	43917
275	43933	43949	43965	43981	43996	44012	44028	44044	44059	44075
276	43091	44107	44122	44138	44154	44169	44185	44201	44217	44232
277	44248	44264	44279	44295	44311	44326	44342	44358	44373	44389
278	44404	44420	44436	44451	44467	44482	44498	44514	44529	44545
279	44560	44576	44607	44607	44623	44638	44654	44669	44685	44700

A Table of Logarithms from 1 to 10,000.

No	0	1	2	3	4	5	6	7	8	9
160	20412	20439	20466	20493	20520	20547	20574	20602	20629	20656
161	20683	20709	20736	20763	20790	20817	20844	20871	20898	20925
162	20951	20978	21005	21032	21059	21085	21112	21139	21165	21192
163	21219	21245	21272	31299	21325	21352	21378	21405	21431	21458
164	21484	21511	21537	21564	21590	21617	21643	21599	21696	21722
165	21748	21775	21801	21827	21853	21886	21906	21932	21958	21985
166	22011	22037	22063	22089	22115	22141	22167	22194	22220	22246
167	22272	22298	22324	22350	22375	22401	22427	22453	22479	22505
168	22531	22555	22583	22608	22634	22660	22686	22711	22737	22763
169	22789	22814	22840	22866	22891	22917	22943	22968	22994	23019
170	23045	23070	23096	23121	23147	23172	23198	23223	23249	23274
171	23300	23325	23350	23376	23401	23426	23452	23477	23502	23528
172	23553	23578	23603	23628	23654	23679	23704	23729	23754	23776
173	23805	23830	23855	23880	23905	23930	23955	23980	24005	24030
174	24055	24080	24105	24130	24155	24179	24204	24229	24254	24279
175	24304	24329	24353	24378	24403	24428	24452	24477	24502	24527
176	24551	24576	24601	24625	24650	24674	24699	24724	24748	24773
177	24797	24822	24846	24871	24895	24920	24944	24969	24993	25018
178	25042	25066	25091	25115	25139	25164	25188	25212	25237	25261
179	25285	25310	25334	25558	25382	25406	25431	25455	25479	25503
180	25527	25551	25575	25600	25624	25648	25672	25696	25720	25744
181	25768	25792	25816	25840	25864	25888	25912	25935	25959	25983
182	26007	26031	26055	26079	26102	26126	26150	20174	26198	26221
183	26245	26269	26292	26316	26340	26364	26387	26411	26434	26458
184	26482	26505	26529	26552	26576	26600	26623	26647	26670	26694
185	26717	26741	26764	26787	26811	26834	26858	26881	26905	26928
186	26951	26975	26998	27021	27045	27068	27091	27114	27138	27161
187	27184	27207	27231	27154	27277	27300	27323	27347	27370	27393
188	27416	27439	27462	27485	27508	27531	27554	27577	27600	27693
189	27646	27669	27692	27715	27738	27761	27784	27807	27830	27832
190	27875	27898	27921	27944	27967	27989	28012	28035	28058	28081
191	28103	28126	28149	28171	28194	28217	28239	28262	28285	28307
192	28330	28353	28375	28398	28420	28443	28460	28488	28511	28533
193	28556	28578	28601	28623	28646	28668	28690	28713	28735	28758
194	28780	28802	28825	28847	28870	28892	28914	28937	28959	28981
195	29003	29026	29048	29070	29092	29115	29137	29159	29181	29203
196	29226	29248	29270	29292	29314	29336	29358	29380	29402	29425
197	29447	29469	29491	29513	29535	29557	29570	29601	29623	29645
198	29666	29688	29710	29732	29754	29776	29798	29820	29842	29863
199	29885	29907	29929	29951	29372	29994	30016	30338	30059	30081
200	30103	30125	30146	30168	30190	30211	30233	30255	30276	30298
201	30320	30341	30363	30384	30406	30427	30449	30471	30492	30514
202	30535	30556	30578	30600	30621	30642	30664	30685	30707	30728
203	30750	30771	30792	30814	30835	30856	30878	30899	30920	30942
204	30963	30984	31006	31027	31048	31069	31091	31112	31130	31154
205	31175	31197	31218	31239	31260	31281	31302	31323	31344	31366
206	31387	31408	31429	31450	31471	31492	31513	31534	31555	31576
207	31597	31618	31639	31660	31681	31702	31723	31744	31764	31785
208	31806	31827	31848	31869	31890	31911	31031	31952	31973	31994
209	32015	32035	32056	32076	32098	32118	32130	32160	32180	32201
210	32222	32243	32203	32284	32305	32325	32346	3236	32387	32408
211	32428	32419	32469	32490	32510	32531	32552	32572	32593	32613
212	32634	62654	32674	2695	32715	32736	32756	32777	32797	32818
213	32838	32868	32879	32899	32919	32940	32960	32980	33001	33021
214	33041	33052	33082	33102	33122	33143	33163	33185	33203	33224
215	33244	33264	33284	33304	33325	33345	33365	33385	33405	33425
216	53415	33645	334 6	33506	33526	33546	33566	33586	33606	33626
217	33646	33666	33686	33706	33726	33746	33766	33786	33806	33826
218	33846	33866	33885	33905	33925	33945	33963	33985	34005	34025
219	34044	34064	34084	34104	34124	34143	34163	34183	34205	34222

A Table of Logarithms from 1 to 10,000.

N°.	0	1	2	3	4	5	6	7	8	9
220	34242	34262	34282	34301	34321	34341	34360	34380	34400	34420
221	34439	34459	34478	34498	34518	34537	34557	34577	34596	34616
222	34635	34655	34674	34694	34713	34733	34752	34772	34791	34811
223	34830	34850	34869	34889	34908	34928	34947	34967	34986	35005
224	35025	35054	35064	35082	35102	35122	35141	35160	35180	35199
225	35218	35237	35257	35276	35295	35315	35334	35353	35372	35392
226	35411	35430	35449	35468	35488	35507	35526	35545	35564	35583
227	35603	35622	35641	35660	35679	35698	35717	35736	35755	35774
228	35793	35812	35832	35851	35870	35889	35908	35927	35946	35965
229	35983	36002	36021	36040	36056	36078	36097	36116	36135	36153
230	36173	36192	36210	36229	36248	36267	36286	36305	36324	36342
231	36361	36380	36399	36418	36436	36455	36474	36493	36511	36530
232	36549	36567	36586	36605	36624	36642	36661	36680	36698	36717
233	36736	36754	36773	36791	36810	36829	36847	36866	36884	36903
234	36922	36940	36959	36977	36996	37014	37033	37051	37070	37088
235	37107	37125	37104	37162	37181	37199	37217	37236	37254	37273
236	37291	37310	37328	37346	37365	37383	37401	37420	37438	37456
237	37475	37493	37511	37530	37548	37566	37585	37603	37621	37639
238	37658	37676	37694	37712	37731	37749	37767	37785	37893	37822
239	37840	37858	37876	37894	37912	37930	37949	37967	37985	38003
240	38021	38039	38057	38075	38093	38111	38330	38148	38166	38184
241	38202	38220	38238	38256	38274	38292	38310	38328	38346	38364
242	38381	38399	38317	38435	38453	38471	38489	38507	38525	38543
243	38561	38578	38596	38614	38632	38650	38668	58685	38703	38721
244	38739	38757	38775	38792	38810	38828	38846	38863	38881	38899
245	38917	38934	38952	38970	38987	39005	39023	39040	39058	39076
246	39093	39111	39129	59146	39164	39182	39199	39217	39234	39252
247	39230	39287	39305	39322	39340	39357	39375	39393	39410	39428
248	39445	39463	39480	39500	39515	39533	39550	39568	39585	39602
249	39620	39637	39655	39672	39690	39707	39724	39742	39759	39777
250	39794	39815	39829	39846	39863	39881	39898	39915	39933	39950
251	39967	39985	40002	40019	40036	40054	40071	40088	40106	40133
252	40140	40157	40174	40192	40209	40226	40243	40260	40278	40295
253	40312	40329	40346	40363	40381	40398	40415	40432	40449	40466
254	40483	40500	40517	40535	40552	40569	40586	40603	40620	40637
255	40653	40671	40688	40705	40722	40739	40756	40773	40790	40807
256	40824	40841	40858	40875	40892	40909	40926	40243	40959	40976
257	40993	41010	41027	41044	41061	41078	41095	41111	41128	41145
258	41162	41179	41196	41212	41229	41246	41263	41280	41296	41313
259	41330	41347	41363	41380	41397	41414	41430	41447	41464	41481
260	41497	41514	41531	41547	41564	41581	41597	41614	41631	41647
261	41664	41681	41697	41714	41731	41747	41764	41780	41797	41813
262	41830	41847	41863	41880	41896	41913	41929	41946	41962	41979
263	41996	42012	42029	42045	42062	42078	42094	42111	42123	42144
264	42160	42177	42193	42210	42226	42243	42256	42275	42292	42303
265	42325	42341	42357	42374	42390	42406	42423	42431	42455	42472
266	42488	42504	42521	42537	42553	42570	42586	42602	42619	42635
267	42651	42667	42684	42700	42716	42732	42749	42765	42781	42797
268	42813	42830	42846	42862	42878	42894	42911	42927	42943	42959
269	42975	42991	43007	43024	43040	43050	43072	43088	43104	43120
270	43136	43152	43168	43185	43201	43217	43233	43249	43265	43281
271	43297	43313	43329	43345	43361	43377	43393	43409	43425	43441
272	43457	43473	43489	43505	43521	43537	43553	43568	43584	43600
273	43616	43632	43648	43664	43680	43696	43712	43727	43743	43759
274	43775	43791	43807	43823	43838	43854	43879	43886	43902	43917
275	43933	43949	43965	43981	43996	44012	44028	44044	44059	44075
276	43091	44107	44122	44138	44154	44169	44185	44201	44217	44232
277	44248	44264	44279	44295	44311	44326	44342	44358	44373	44389
278	44404	44420	44436	44451	44467	44482	44498	44514	44529	44545
279	44560	44576	44607	44607	44623	44638	44654	44669	44685	44700

A Table of Logarithms from 1 to 10,000.

No.	0	1	2	3	4	5	6	7	8	9
280	44716	44731	44747	44762	44778	44793	44809	44824	44840	44855
281	44871	44886	44907	44917	44932	44948	44963	44979	44994	45009
282	45025	45040	45056	45071	45086	45102	45117	45132	45148	45163
283	45179	45194	45209	45225	45240	45255	45271	45286	45301	45316
284	45332	45347	45362	45378	45393	45408	45423	45439	45454	45469
285	45484	45500	45515	45530	45545	45661	45576	45591	45606	45622
286	45637	45652	45667	45682	45697	45712	45728	45743	45760	45773
287	45788	45803	45818	45837	45889	45864	45894	45894	45909	45924
288	45939	45954	45969	45984	45999	46015	46045	46045	46060	46075
289	46090	46105	46120	46135	46150	46165	46180	46195	46210	46225
290	46240	46255	46270	46285	46300	46315	46329	46344	46359	46374
291	46389	46404	46419	46434	46449	46464	46479	46494	46508	46523
292	46538	46553	46568	46583	46598	46612	46627	46642	46657	46672
293	46687	46702	46716	46731	46746	46761	46776	46790	46805	46820
294	46835	46849	46864	46879	46894	46908	46923	46938	46953	46967
295	46982	46997	47012	47026	47041	47056	47070	47085	47100	47114
296	47129	47144	47158	47173	47188	47202	47217	47222	47246	47261
297	47276	47290	47305	47319	47334	47349	47363	47378	47392	47407
298	47422	47436	47451	47465	47480	47494	47510	47523	47538	47553
299	47567	47582	47596	47611	47625	47640	47654	47669	47683	47698
300	47712	47727	47741	47755	47770	47784	47799	47813	47828	47842
301	47857	47871	47885	47900	47914	47629	47943	47957	47972	47986
302	48001	48015	48029	48044	48058	48072	48087	48101	48 16	48130
303	48144	48159	48173	48187	48202	48216	48230	48244	48259	48273
304	48287	48302	48316	48330	48344	48359	48373	48387	48401	48416
305	48430	48444	48458	48473	48487	48501	48515	48529	48544	48558
306	48572	48586	48600	48615	48629	48643	48657	48671	48685	48700
307	48714	48728	48742	48756	48770	48784	48799	48813	48827	48841
308	48855	48869	48883	48897	48911	48925	48940	48954	48968	48982
309	48996	49010	49024	49038	59052	49066	49080	49094	49108	49122
310	49136	49150	49164	49178	49192	49200	49220	49234	49248	49262
311	49276	49290	49304	49318	49332	49346	49360	49374	49388	49401
312	49415	49429	49443	49457	49471	49485	49499	49513	49527	49541
313	49554	49568	49582	49596	49610	49624	49638	49651	49665	49679
314	49693	49707	49721	49734	49748	49762	49776	49790	49803	49817
315	49831	49845	49859	49872	49886	49900	49914	49927	49941	49955
316	49969	49982	49996	50010	50024	50037	50051	50062	50078	50093
317	50106	50120	50133	50147	50161	50174	50188	50202	50215	50229
318	50243	50256	50270	50284	50297	50311	50325	50338	50352	50305
319	50379	50393	50406	50420	50431	50447	50461	50474	50488	50501
320	50515	50529	50542	50556	50569	50583	50596	50610	50623	50637
321	50650	50664	50677	50691	50705	50718	50732	50745	50759	50772
322	50786	50799	50812	50826	50839	50853	50866	50880	50893	50907
323	50920	50934	50947	50961	50974	50987	51001	51014	51028	51041
324	51054	51068	51081	51095	51108	51121	51135	51148	51162	51175
325	51188	51202	51215	51228	51242	51255	51268	51282	51295	51308
326	51322	51335	51348	51362	51375	51388	51402	51415	51428	51451
327	51455	51468	51481	51495	51508	51521	51534	51548	51561	51574
328	51587	51601	51614	51627	51640	51653	51667	51680	51693	51706
329	51720	51733	51746	51759	51772	51785	51799	51812	51825	51838
330	51851	51864	51878	51891	51904	51917	51930	51943	51956	51970
331	51983	51996	52009	52022	52035	52048	52061	52074	52088	52101
332	52114	52127	52140	52153	52166	52179	52192	52205	52218	52231
333	52244	52257	52270	52283	52297	52310	52323	52336	52349	52362
334	52375	52388	52401	52414	52427	52440	52453	52466	52578	52491
335	52504	52517	52530	52543	52556	52569	52582	52595	52608	52621
336	52634	52647	52660	52673	52686	52698	52711	52724	52737	52750
337	52163	52776	52789	52802	52814	52827	52840	52852	52866	52879
338	52892	52904	52917	52930	52943	52956	52969	52981	52994	53007
339	53020	53033	53046	53058	53071	53084	53097	53109	53122	53135

A Table of Logarithms from 1 to 10,000.

No.	0	1	2	3	4	5	6	7	8	9
340	53148	53161	53173	53186	53199	53212	53224	53237	53250	53263
341	53275	53288	53301	53314	53326	53339	53352	53364	53377	53390
342	53403	53415	53428	53441	53453	53466	53479	53491	53504	53517
343	53529	53542	53555	53567	53580	53593	53605	53618	53631	53643
344	53656	53668	53681	53694	53706	53719	53731	53744	53767	53769
345	53782	53794	53807	53820	53832	53845	53857	53870	53882	53895
346	53908	53920	53933	53945	53958	53970	53983	53995	54008	54020
347	54033	54045	54058	54070	54083	54095	54108	54120	54133	54145
348	54158	54170	54183	54195	54208	54220	54233	54245	54258	54270
349	54182	54295	54307	54320	54332	54345	54357	54370	54382	54394
350	54407	54419	54432	54444	54456	54469	54481	54494	54506	54518
351	54531	54543	54555	54568	54580	54592	54605	54617	54630	54642
352	54654	54667	54679	54691	54704	54716	54728	54740	54753	54765
353	54777	54790	54802	54814	54827	54839	54851	54863	54876	54888
354	54900	54913	54925	54937	54949	54962	54974	54986	54998	55011
355	55023	55035	55047	55059	55072	55084	55096	55108	55121	55133
356	55145	55157	55169	55182	55194	55200	55218	55230	55242	55255
357	55267	55279	55291	55303	55315	55328	55340	55352	55364	55376
358	55388	55400	55413	55425	55437	55449	55461	55473	55485	55497
359	55509	55521	55534	55546	55558	55570	55582	55594	55606	55618
360	55630	55642	55654	55666	55678	55690	55303	55715	55727	55739
361	55751	55763	55775	55787	55799	55811	55823	55835	55847	55859
362	55871	55883	55895	55907	55919	55931	55943	55955	55967	55979
363	55991	56003	56015	56026	56039	56050	56062	56074	56086	56098
364	56110	56122	56134	56146	56158	56170	56182	56193	56205	56217
365	56229	56241	56253	56265	56277	56289	56301	56312	56324	56336
366	56348	56360	56372	56384	56395	56407	56419	56431	56443	56455
367	56467	56478	56490	56502	56514	56526	56537	56549	56561	56573
368	56585	56597	56608	56620	56630	56644	56655	56667	56679	56691
369	56703	56714	56726	56738	56750	56761	56773	56785	56797	56808
370	56820	56832	56844	56855	56867	56879	56890	56902	56914	56926
371	56937	56940	56961	56972	56984	56996	57008	57019	57031	57043
372	57054	57066	57078	57089	57101	57113	57123	57136	57148	57159
373	57171	57182	57194	57206	57217	57229	57241	57252	57264	57275
374	57287	57299	57310	57322	57334	57345	57357	57368	57380	57391
375	57403	57415	57426	57438	57449	57461	57473	57484	57496	57507
376	57519	57530	57542	57553	57565	57576	57588	57600	57611	57623
377	57634	57646	57657	57669	57680	57692	57703	57715	57726	57738
378	57749	57761	57772	57784	57795	57807	57818	57829	57841	57852
379	57864	57875	57887	57898	57910	57921	57933	57944	57955	57967
380	57978	57990	58001	58013	58024	58035	58047	58058	58070	58081
381	58092	58104	58115	58127	58138	58159	58161	58172	58184	58195
382	58206	58218	58229	58240	58252	58263	58274	58286	58297	58308
383	58320	58331	58342	58354	58365	58376	58388	58399	58410	58422
384	58433	58444	58456	58467	58478	58490	58501	58512	58523	58535
385	58546	58557	58569	58580	58591	58602	58614	58625	58636	58647
386	58659	58670	58681	58692	58704	58715	58726	58737	58749	58760
387	58771	58782	58793	58805	58816	58827	58838	58850	58861	58872
388	58883	58894	58905	58917	58928	58939	58950	58961	58973	58984
389	58995	59006	59017	59028	59040	59051	59062	59073	59084	59095
390	59106	59118	59129	59140	59151	59162	59173	59184	59195	59207
391	59218	59229	59240	59251	59262	59273	59284	59295	59306	59317
392	59329	59340	59351	59362	59373	59384	59395	59406	59417	59428
393	59439	59450	59461	59472	59483	59494	59505	59516	59528	59539
394	59550	59561	59572	59583	59594	59605	59616	59627	59638	59649
395	59650	39671	59682	59693	59704	59714	59726	59737	59748	59758
396	59769	59780	59791	59802	59813	59824	59835	59846	59857	59868
397	59879	59890	59901	59912	59923	59934	59945	59956	59966	59977
398	59988	59999	60010	60021	60032	60043	60054	60065	60075	60089
399	60097	60108	60119	60130	60140	60152	60162	60173	60184	60195

A Table of Logarithms from 1 to 10,000.

N°.	0	1	2	3	4	5	6	7	8	9
400	60206	60217	60228	60236	60249	60260	60271	60282	60293	60304
401	60314	60325	60336	60347	60358	60368	60379	60390	60401	60412
402	60423	60433	60444	60455	60466	60477	60487	60498	60509	60520
403	60530	60541	60552	60563	60574	60584	60595	60606	60617	60627
404	60638	60649	60660	60670	60681	60692	60703	60713	60724	60735
405	60749	60756	60767	60778	60788	60799	60810	60820	60831	60842
406	60853	60863	60874	60885	60895	60906	60917	60927	60938	60949
407	60959	60970	60981	60991	61002	61013	61023	61034	61045	61055
408	61066	61077	61087	61098	61109	61119	61130	61140	61151	61162
409	61172	61183	61194	61204	61215	61225	61236	61247	61257	61268
410	61278	61289	61300	61310	61321	61331	61342	61352	61363	61374
411	61384	61395	61405	61416	61426	61457	61447	61458	61469	61479
412	61490	61500	61511	61521	61532	61542	61553	61563	61574	61584
413	61595	61605	61616	61626	61637	61647	61658	61668	61679	61686
414	61700	61710	61721	61731	61742	61752	61763	61773	61784	61794
415	61805	61815	61826	61836	61847	61857	61867	61878	61888	61899
416	61909	61920	61930	61941	61951	61961	61972	61982	61993	62003
417	62014	62024	62034	62045	62055	62066	61076	62086	62097	62107
418	62118	62128	62138	62149	62159	62169	62180	62190	62201	62211
419	62221	62232	62242	62252	62263	62273	62283	62294	62304	62315
420	62325	62335	62346	62356	62366	62377	62387	62397	62408	62418
421	62428	62438	62449	62459	62469	62480	62490	62500	62511	62521
422	62531	62541	62552	62562	62572	62583	62593	62603	62613	62624
423	62634	62644	62655	62665	62675	62685	62696	62707	62716	62726
424	62737	62747	62757	62767	62777	62788	62798	62808	62818	62829
425	62839	62849	62859	62869	62880	62890	62900	62910	62921	62931
426	62941	62951	62961	62971	62982	62992	62002	63010	63012	63033
427	63043	63053	63063	63073	63083	63094	63104	63114	63124	63134
428	63144	63154	63165	63175	63185	63195	63205	63215	63225	63136
429	63246	63256	63266	63276	63286	63296	63306	63316	63327	63337
430	63347	63357	63367	63377	63387	63397	63407	63417	63428	63438
431	63448	63458	63468	63478	63488	63498	63508	63518	63528	63537
432	63548	63558	63568	63578	63589	63599	63609	63619	63629	63639
433	63649	63659	63669	63679	63689	63699	63709	63719	63729	63739
434	63749	63759	63769	63779	63789	63799	63809	63819	63829	63839
435	63849	63859	63869	63879	63889	63899	63909	63919	63929	63939
436	63949	63959	63969	63978	63988	63998	64008	64018	64028	64238
437	64048	64058	64068	64078	64088	64098	64108	64118	64128	64137
438	64147	64157	64167	64177	64187	64197	64207	64217	64227	64237
439	64246	64256	64266	64276	64286	64296	64306	64316	64325	64335
440	64345	64355	64365	64375	64385	64395	64404	64414	64424	64434
441	64444	64454	64463	64473	64483	64493	64503	64513	64522	64532
442	64542	64552	64562	64572	64581	64591	64601	64611	64621	64631
443	64640	64640	64660	64670	64680	64682	64699	64709	64719	64728
444	64738	64748	64758	64768	64777	64787	64797	64807	64816	64826
445	64836	64846	64865	64865	64873	64885	64894	64904	64914	64924
446	64933	64943	64953	64963	64972	64982	64992	65002	65011	65021
447	65031	65040	65050	65060	65070	65079	65086	65099	65108	65118
448	65128	65137	65147	65157	65167	65176	65186	65196	65205	65215
449	65225	65234	65244	65254	65263	65273	65283	65292	65302	65312
450	65321	65331	65340	65350	65360	65369	65379	65389	65398	65408
451	65418	65427	65437	65446	65459	65866	65475	65485	65495	65304
452	65514	65523	65533	65543	65552	65562	65571	65581	65591	65600
453	65610	65619	65629	65639	65648	65658	65667	65677	65686	65696
454	65706	65715	65725	65734	65744	65753	65763	65772	65782	65792
455	65801	65811	65820	65830	65839	65849	65858	65868	65877	65887
456	65896	65906	65915	65925	65935	65944	65954	65963	65973	65982
457	65992	66001	66011	66020	66030	66039	66049	66058	66068	66077
458	66086	66096	66105	66115	66124	66134	66143	66153	66162	66172
459	66181	66191	66200	66210	66219	66228	66238	66247	66257	66266

A Table of Logarithms from 1 to 10,000.

No.	0	1	2	3	4	5	6	7	8	9
460	66276	66285	66295	66304	66313	66323	66332	66342	66351	66361
461	66370	66379	66389	66398	66408	66417	66427	66436	66445	66455
462	66464	66474	66483	66492	66502	66511	66521	66530	66539	66549
463	66558	66567	66577	66586	66596	66605	66614	66624	66633	66642
464	66652	66661	66670	66680	66689	66699	66708	66717	66727	66736
465	66745	66755	66764	66773	66783	66792	66801	66811	66820	66829
466	66839	66848	66857	66866	66876	66885	66894	66904	66913	66922
467	66932	66941	66950	66960	66969	66978	66887	66997	67006	67015
468	67095	67034	66043	67052	67062	67071	67080	67089	67099	67108
469	67117	67126	67136	67145	67154	67164	67173	67182	67191	67200
470	67210	67219	67228	67237	67247	67256	67265	67274	67284	67293
471	67302	67311	67320	67330	67339	67348	67357	67367	67376	67385
472	67394	67403	67413	67422	67431	67440	67449	67459	67468	67477
473	67486	67495	67504	67514	67523	67532	67541	67550	67559	67569
474	67578	67587	67596	67605	67614	67624	67633	67642	67651	67660
475	67669	67678	67688	67697	67706	67715	67724	67733	67742	67752
476	67761	67770	67779	67788	67797	67806	67815	67824	67834	67843
477	67852	67861	67870	67879	67888	67897	67906	67915	67925	67934
478	67943	67952	67961	67970	67979	67988	67997	68006	68015	68024
479	68033	68043	68052	68061	68070	68079	68088	68097	68106	68115
480	68124	68133	68142	68151	68160	68169	68178	68187	68196	68205
481	68214	68223	68233	68242	68251	68260	68269	68278	68287	68296
482	68305	68314	68323	68332	68341	68350	68359	68368	68377	68386
483	68395	68404	68413	68422	68431	68440	68449	68458	68467	68476
484	68484	68493	68502	68511	68520	68529	68538	68547	68556	68565
485	68574	68583	68592	68601	68610	68619	68628	68637	68646	68655
486	68664	68673	68681	68690	68699	68708	68717	68726	68735	68744
487	68753	68762	68771	68780	68788	68897	68706	68815	68824	68833
488	68842	68851	68860	68869	68878	68886	68895	68900	68913	68922
489	68931	68940	68948	68957	68969	68975	68984	68993	69002	69011
490	69020	69028	69037	69046	69055	69064	69073	69082	69090	69099
491	69108	69117	69126	69135	69143	69152	69161	69170	69179	69188
492	69196	69205	69214	69223	69232	69241	69249	69258	69267	69276
493	69285	69293	69302	69311	69320	69329	69337	69346	69355	69364
494	69373	69381	69390	69399	69408	69417	69425	69434	69443	69452
495	69460	69469	69478	69487	69496	69504	69513	69522	69531	69539
496	69548	69557	69566	69574	69583	69592	69601	69609	69618	69627
497	69636	69644	69653	69662	69671	69679	69688	69697	69705	69714
498	69723	69732	69740	69749	69758	69766	69775	69784	69793	69801
499	69810	69819	69827	69836	69845	69853	69862	69871	69880	69888
500	69897	69906	69914	69923	69932	69940	69949	69968	69966	69975
501	69984	69992	70001	70010	70018	70027	70036	70044	70053	70062
502	70070	70079	70088	70096	70105	70114	70122	70131	70139	70148
503	70157	70165	70174	70183	70191	70200	70209	70217	70226	70234
504	70243	70252	70260	70269	70277	70286	70295	70303	70312	70329
505	70829	70338	70346	70355	70363	70372	70381	70389	70398	70406
506	70915	70424	70432	70441	70449	70458	70466	70475	70484	70492
507	70501	70509	70518	70526	70535	70544	70552	70561	70569	70578
508	70586	70595	70603	70612	70620	70629	70638	70646	70655	70663
509	70672	70680	70689	70697	70706	70714	70723	70731	70740	70748
510	70757	70765	70774	70783	70791	70800	70808	70817	70825	70834
511	70842	70851	70859	70868	70876	70885	70893	70901	70910	70918
512	70927	70935	70943	70952	70961	70969	70978	70986	70995	71003
513	71012	71020	71029	71037	71045	71054	71062	71071	71079	71088
514	71096	71105	71113	71122	71130	71138	71147	71155	71164	71172
515	71181	71189	71198	71206	71214	71223	71231	71240	71248	71256
516	71265	71273	71282	71390	71299	71307	71315	71324	71332	71341
517	71349	71357	71366	71374	71383	71391	71399	71408	71416	71425
518	71433	71441	71450	71458	71466	71475	71483	71492	71500	71508
519	71517	71525	71533	71542	71550	71559	71567	71575	71584	71592

A Table of Logarithms from 1 to 10,000.

N°.	0	1	2	3	4	5	6	7	8	9
520	71600	71609	71617	71625	71634	71642	71650	71659	71667	71675
521	71684	71692	71760	71709	71717	71725	71734	71742	71750	71759
522	71767	71775	71784	71792	71800	71809	71817	71825	71834	71842
523	71850	71858	71867	71875	71883	71892	71900	71908	71916	71925
524	71933	71941	71950	71958	71966	71974	71983	71991	71999	72008
525	72016	72024	72032	72041	72049	72057	72065	72074	72082	72090
526	72099	72107	72115	72123	72132	72140	72148	72156	72165	72173
527	72181	72189	72197	72206	72214	72222	72230	72239	72247	72255
528	72263	72272	72280	72288	72296	72304	72318	72321	72329	72337
529	72346	72354	72362	72370	72378	72387	72395	72403	72411	72419
530	72428	72436	72444	72452	72460	72468	72477	72485	72493	72501
531	72509	72518	72526	72534	72542	72550	72558	72567	72575	72583
532	72591	72599	72607	72616	72624	72632	72640	72648	72656	72665
533	72673	72681	72689	72697	72705	72713	72722	72730	72738	72746
534	72754	72762	72770	72778	72787	72795	72803	72811	72819	72827
535	72835	72843	72852	72860	72868	72876	72884	72892	72900	72908
536	72916	72925	72933	72941	72949	72957	72965	72973	72981	72989
537	72997	73005	73014	73022	73030	73038	73046	73054	73062	73070
538	73078	73086	73094	73102	73110	73119	73127	73135	73143	73151
539	73159	73167	73175	73183	73191	73199	73207	73215	73223	73231
540	73239	73247	73255	73263	73271	73280	73288	73296	73304	73312
541	73320	73328	73336	73344	73352	73360	73368	73376	73384	73392
542	73400	73408	73416	73424	73432	73440	73448	73456	73464	73472
543	73480	73488	73496	73504	73512	73520	73528	73536	73544	73552
544	73560	73568	73576	73584	73592	73600	73608	73616	73623	73632
545	73640	73648	73656	73663	73671	73679	73687	73695	73703	73711
546	73720	73727	73735	73743	73751	73759	73767	73775	73783	73791
547	73799	73807	73815	73822	73830	73838	73846	73854	73862	73870
548	73878	73886	73894	73902	73910	73918	73926	73933	73941	73949
549	73957	73965	73973	73981	73989	73997	74005	74013	74020	74028
550	74036	74044	74052	74060	74068	74076	74084	74091	74099	74107
551	74115	74123	74131	74139	74147	74155	74162	74170	74178	74186
552	74194	74202	74210	74217	74225	74233	74241	74249	74257	74265
553	74272	74280	74288	74296	74304	74312	74320	74327	74335	74343
554	74351	74359	74367	74374	74382	74390	74398	74406	74414	74421
555	74429	74437	74445	74453	74461	74468	74476	74484	74492	74500
556	74507	74515	74523	74531	74539	74546	74554	74562	74570	74578
557	74585	74593	74601	74609	74617	74624	74632	74640	74648	74656
558	74663	74671	74679	74687	74694	74702	74710	74718	74726	74733
559	74741	74749	74757	74764	74772	74780	74788	74795	74803	74811
560	74819	74827	74834	74842	74850	74858	74865	74873	74881	74888
561	74896	74904	74912	74919	74927	74935	74943	74950	74958	74966
562	74974	74981	74989	74997	75004	75012	75020	75028	75035	75043
563	75051	75059	75066	75074	75082	75089	75097	75105	75112	75120
564	75128	75136	75143	75151	75159	75166	75174	75182	75189	75197
565	75205	75212	75220	75228	75236	75243	75251	75259	75266	75274
566	75282	75289	75297	75305	75312	75320	75328	75335	75343	75351
567	75358	75366	75374	75381	75389	75397	75404	75412	75419	75427
568	75435	75442	75450	75458	75465	75473	75481	75488	75496	75503
569	75511	75519	75526	75534	75542	75549	75557	75565	75572	75580
570	75587	75595	75603	75610	75618	75626	75633	75641	75648	75656
571	75664	75671	75679	75686	75694	75702	75709	75717	75724	75732
572	75740	75747	75755	75762	75770	75777	75785	75793	75800	75808
573	75815	75823	75831	75838	75846	75853	75861	75868	75876	75884
574	75891	75899	75906	75914	75921	75929	75937	75944	75952	75959
575	75967	75974	75982	75989	75997	76005	76012	76020	76027	76035
576	76042	76050	76057	76065	76072	76080	76087	76095	76102	76110
577	76118	76125	76133	76140	76148	76155	76163	76170	76178	76185
578	76193	76200	76208	76215	76223	76230	76238	76245	76253	76260
579	76268	76275	76283	76290	76298	76305	76313	76320	76328	76335

A Table of Logarithms from 1 to 10,000.

N°.	0	1	2	3	4	5	6	7	8	9
580	76343	76350	76358	76365	76373	76380	76388	76395	76403	76410
581	76418	76425	76433	76440	76447	76455	76462	76470	76477	76485
582	76492	76500	76507	76515	76522	76530	76537	76544	76552	76559
583	76567	76574	76582	76589	76597	76604	76611	76619	76626	76634
584	76641	76649	76656	76664	76671	76678	76686	76693	76701	76708
585	76716	76723	76730	76738	76745	76753	76760	76767	76775	76782
586	76790	76797	76804	76812	76819	76827	76834	76842	76849	76856
587	76864	76871	76879	76886	76893	76901	76908	76916	76923	76930
588	76938	76945	76952	76960	76967	76975	76982	76989	76997	77004
589	77011	77019	77026	77034	77041	77048	77056	77063	77070	77078
590	77085	77093	77100	77107	77115	77122	77129	77137	77144	77151
591	77159	77166	77173	77181	77188	77195	77203	77210	77217	77225
592	77232	77239	77247	77254	77261	77269	77276	77283	77291	77298
593	77305	77313	77320	77327	77335	77342	77349	77357	77364	77371
594	77379	77386	77393	77401	77408	77415	77422	77430	77437	77444
595	77452	77459	77466	77474	77481	77488	77495	77503	77510	77517
596	77525	77532	77539	77546	77554	77561	77568	77576	77583	77590
597	77597	77605	77612	77619	77626	77634	77641	77648	77656	77663
598	77670	77677	77685	77692	77699	77706	77714	77721	77728	77735
599	77743	77750	77757	77764	77772	77779	77786	77793	77801	77808
600	77815	77822	77830	77837	77844	77851	77858	77866	77873	77880
601	77887	77895	77902	77909	77916	77924	77931	77938	77945	77952
602	77960	77967	77974	77981	77988	77996	78003	78010	78017	78024
603	78032	78039	78046	78053	78060	78068	78075	78082	78089	78096
604	78104	78111	78118	78125	78132	78140	78147	78154	78161	78168
605	78175	78183	78190	78197	78204	78211	78219	78226	78233	78240
606	78247	78254	78262	78269	78276	78283	78290	78297	78305	78312
607	78319	78326	78333	78340	78347	78355	78362	78369	78376	78383
608	78390	78397	78405	78412	78419	78426	78433	78440	78447	78455
609	78462	78469	78476	78483	78490	78497	78504	78512	78519	78526
610	78533	78540	78547	78554	78561	78569	78576	78583	78590	78597
611	78604	78611	78618	78625	78632	78640	78647	78654	78661	78668
612	78675	78682	78689	78696	78703	78711	78718	78725	78732	78739
613	78746	78753	78760	78767	78774	78781	78788	78796	78803	78810
614	78817	78824	78831	78838	78845	78852	78859	78866	78873	78880
615	78887	78895	78902	78909	78915	78923	78930	78937	78944	78951
616	78958	78965	78972	78990	78986	78993	79000	79007	79014	79021
617	79028	79036	79043	79050	79057	79064	79071	79078	79085	79092
618	79099	79106	79113	79120	79127	79134	79141	79148	79155	79162
619	79169	79176	79183	79190	79197	79104	79211	79218	79225	79232
620	79239	79246	79253	79260	79267	79274	79281	79288	79295	79302
621	79309	79316	79323	79330	79337	79344	79351	79358	79365	79372
622	79379	79386	79393	79400	79407	79414	79421	79428	79435	79442
623	79449	79456	79463	79470	79477	79484	79491	79498	79404	79511
624	79518	79525	79532	79539	79546	79553	79560	79567	79574	79581
625	79588	79595	79602	79609	79616	79623	79630	79637	79644	79650
626	79657	79664	79671	79678	79685	79692	79699	79706	79713	79720
627	79727	79734	79741	79747	79754	79761	79768	79775	79782	79789
628	79796	79803	79810	79817	79824	79830	79837	79844	79851	79858
629	79865	79872	79879	79886	79893	79900	79906	79913	79920	79927
630	79934	79941	79948	79955	79962	79968	79975	79982	79989	79996
631	80003	80010	80017	80024	80030	80037	80044	80051	80058	80065
632	80072	80079	80085	80092	80099	80106	80113	80120	80127	80133
633	80140	80147	80154	80161	80168	80175	80181	80188	80195	80202
634	80209	80216	80223	80229	80236	80243	80250	80257	80263	80270
635	80277	80284	80291	80298	80305	80312	80318	80325	80332	80339
636	80346	80352	80359	80366	80373	80380	80387	80393	80400	80407
637	80414	80421	80428	80434	80441	80448	80455	80462	80468	80475
638	80482	80489	80496	80502	80509	80516	80523	80530	80536	80543
639	80550	80557	80564	80570	80577	80584	40591	80598	80604	80611

A Table of Logarithms from 1 to 10,000.

N°.	0	1	2	3	4	5	6	7	8	9
640	80618	80625	80632	80638	80645	80652	80659	80665	80672	80679
641	80686	80693	80699	80706	80713	80720	80726	80733	80740	80747
642	80753	80760	80767	80774	80781	80787	80794	80801	80807	80814
643	80821	80828	80835	80841	80848	80855	80862	80868	80875	80882
644	80889	80895	80902	80909	80915	80922	80929	80936	80942	80949
645	80956	80963	80969	80976	80983	80990	80996	81003	81010	81016
646	81023	81030	81037	81043	81050	81057	81064	81070	81077	81084
647	81090	81097	81104	81111	81117	81124	81131	81137	81144	81151
648	81157	81164	81171	81178	81184	81191	81198	81204	81211	81218
649	81224	81231	81238	81244	81251	81258	81276	81271	81278	81285
650	81291	81298	81305	81311	81318	81325	81331	81338	81345	81351
651	81358	81365	81371	81378	81385	81391	81398	81405	81411	81413
652	81425	81431	81438	81445	81451	81458	81465	81471	81478	81485
653	81491	81498	81505	81511	81518	81525	81531	81538	81544	81551
654	81558	81564	81571	81578	81584	81591	81598	81604	81611	81617
655	81624	81631	81637	81644	81651	81657	81664	81670	81677	81684
656	81690	81697	81704	81710	81717	81723	81730	81737	81743	81750
657	81756	81763	81770	81776	81783	81790	81796	81803	81809	81816
658	81823	81829	81836	81842	81849	81856	81862	81869	81875	81882
659	81888	81895	81902	81908	81915	81921	81928	81935	81941	81948
660	81954	81961	81967	81974	81981	81987	81994	82000	82007	82014
661	82020	82027	82033	82040	82046	82053	82059	82066	82073	82079
662	82086	82092	82099	82105	82112	82119	82125	82132	82138	82145
663	82151	82158	82164	82171	82177	82184	82191	82197	82204	82210
664	82217	82223	82230	82236	82243	82249	82256	82263	82269	82276
665	82282	82289	82295	82302	82308	82315	82321	82328	82334	82341
666	82347	82354	82360	82367	82373	82380	82386	82393	82400	82406
667	82413	82419	82426	82432	82439	82445	82452	82458	82464	82471
668	82478	82484	82491	82497	82504	82510	82517	82523	82530	82536
669	82543	82549	82556	82562	82569	82575	82581	82588	82594	82501
670	82607	82614	82620	82627	82633	82640	82646	82653	82659	82665
671	82672	82679	82685	82692	82698	82705	82711	82717	82724	82730
672	82737	82743	82750	82756	82763	82769	82776	82782	82789	82795
673	82801	82808	82814	82821	82827	82834	82840	82847	82753	82859
674	82866	82872	82879	82885	82892	82898	82905	82911	82917	82924
675	82930	82937	82943	82950	82956	82962	82969	82975	82982	82988
676	82995	82001	83007	83014	83020	83027	83033	83040	83046	83052
677	83059	83065	83072	83078	83084	83091	83097	83104	83110	83117
678	83128	83129	83136	83142	83149	83155	83161	83168	83174	83181
679	83187	83193	83200	83206	83212	83219	83225	83232	83238	83244
680	83251	83257	83264	83270	83276	83285	83289	83296	83302	83308
681	83315	83321	83327	83334	83340	83347	83353	83359	83366	83372
682	83378	83385	83391	83397	83404	83410	83417	83423	83429	83436
683	83442	83448	83455	83461	83467	83474	83480	83487	83493	83499
684	83506	83512	83518	83525	83531	83537	83544	83550	83556	83563
685	83169	83575	83582	83588	83594	83601	83607	83613	83620	83626
686	83632	83639	83645	83651	83658	83664	83670	83677	83683	83689
687	83696	83702	83708	83715	83721	83727	83734	83740	83746	83752
688	83759	83765	83771	83778	83784	83790	83797	83803	83809	83816
689	83822	83828	83834	83841	83847	83853	83860	83866	83872	83879
690	83885	83891	83897	83904	83910	83916	83923	83929	83935	83941
691	83948	83954	83960	83967	83973	83979	83985	83992	83998	84004
692	84011	84017	84023	84029	84036	84042	84048	84054	84061	84067
693	84073	84080	84086	84092	84098	84105	84111	84117	84123	84130
694	84136	84142	84148	84155	84161	84167	84173	84180	84186	84192
695	84198	84205	84211	84217	84223	84230	84236	84242	84248	84255
696	84261	84267	84273	84280	84286	84292	84298	84305	84311	84317
697	84323	84329	84336	84342	84349	84354	84361	84367	84373	84379
698	84385	84392	84398	84404	84410	84417	84423	84429	84435	84441
699	84448	84454	84460	84466	84473	84479	84485	84491	84407	84504

A Table of Logarithms from 1 to 10,000.

N°.	0	1	2	3	4	5	6	7	8	9
700	84510	84516	84522	84528	84535	84541	84547	84553	84559	84566
701	84572	84578	84584	84590	84596	84602	84609	84615	84621	84627
702	84634	84640	84646	84652	84658	84665	84671	84677	84683	84689
703	84695	84702	84708	84714	84720	84726	84733	84739	84745	84751
704	84757	84763	84770	84776	84782	84788	84794	84800	84807	84813
705	84819	84825	84831	84837	84843	84850	84856	84862	84868	84874
706	84880	84887	84893	84899	84905	84911	84917	84923	84930	84936
707	84942	84948	84954	84960	84966	84973	84979	84985	84991	84997
708	85003	85009	85016	85022	85028	85034	85040	85046	85052	85058
709	85065	85071	85077	85083	85089	85095	85101	85107	85114	85120
710	85126	85132	85138	85144	85150	85150	85162	85169	85175	85181
711	85187	85193	85199	85205	85211	85217	85224	85230	85236	85242
712	85248	85254	85260	85266	85272	85278	85285	85291	85297	85303
713	85309	85315	85321	85327	85333	85339	85345	85352	85358	85364
714	85370	85376	85382	85388	85394	85400	85406	85412	85418	85424
715	85431	85437	85443	85449	85455	85461	85467	85473	85479	85485
716	85491	85497	85503	85509	85516	85522	85528	85534	85540	85546
717	85552	85558	85564	85570	85576	85582	85588	85594	85600	85606
718	85612	85618	85624	85631	85637	85643	85649	85655	85661	85667
719	85673	85679	85685	85691	85697	85703	85709	85715	85721	85727
720	85733	85739	85745	85751	85757	85763	85769	85775	85781	85787
721	85793	85799	85806	85812	85818	85824	85830	85836	85842	85848
722	85854	85860	85866	85872	85878	85884	85890	85896	85902	85908
723	85914	85920	85926	85932	85938	85644	85950	85956	85962	85968
724	85974	85980	85986	85692	85998	86004	86010	86016	86022	86028
725	86034	86040	86046	86052	86058	86064	86070	86076	86082	86088
726	86094	86100	86106	86112	86118	86124	86130	86235	86141	86147
727	86153	86159	86165	86171	86177	86183	86189	86195	86201	86207
728	86213	86219	86225	86231	86237	86243	86249	86255	86261	86267
729	86273	86279	86285	86291	86297	86302	86308	86314	84320	86326
730	86332	86338	86344	86350	86356	86362	86368	86374	86380	86386
731	86392	86398	86404	86410	86415	86421	86427	86433	86439	86445
732	86451	86457	86463	86469	86475	86481	86487	86493	86498	86504
733	86510	86516	86522	86528	86534	86540	86546	86552	86558	86564
734	86570	86575	86581	86587	86593	86599	86605	86611	86617	86623
735	86629	86635	86640	86646	86652	86658	86664	86670	86676	86682
736	86688	86694	86700	86705	86711	86717	86723	86729	86735	86741
737	86747	86753	86758	86764	86770	86776	86782	86788	86794	86800
738	86806	86811	86817	86823	86829	86835	86841	86847	86853	86859
739	86864	86870	86876	86882	86888	86894	86900	86906	86911	86917
740	86923	86929	86935	86941	86947	86952	86958	86964	86970	86976
741	86982	86988	86993	86999	87005	87011	87017	87023	87029	87034
742	87040	87046	87052	87058	87004	87070	87075	87081	87087	87093
743	87099	87105	87111	87116	87122	87128	87134	87140	87146	87151
744	87157	87163	87169	87175	87181	87186	87192	87198	87204	87210
745	87216	87221	87227	87233	87239	87245	87251	87256	87262	87268
746	87274	87280	87285	87291	87297	87303	87309	87315	87320	87326
747	87332	87338	87344	87349	87355	87361	87367	87373	87378	87384
748	87390	87396	87402	87408	87413	87419	87425	87431	87437	87442
749	87448	87454	87460	87466	87471	87477	87483	87489	87494	87500
750	87506	87512	87518	87523	87529	87535	87541	87547	87552	87558
751	87564	87570	87576	87581	87587	87593	87599	87604	87610	87616
752	87622	87628	87633	87639	87645	87651	87656	87662	87668	87674
753	87679	87685	87691	87697	87702	87708	87714	87720	87726	87731
754	87737	87743	87749	87754	87760	87766	87772	87777	87783	87788
755	87795	87800	87806	87812	87818	87823	87829	87835	87841	87846
756	87852	87858	87864	87869	87875	87881	87887	87892	87898	87904
757	87910	87915	87921	87927	87932	87938	87944	87950	87955	87961
758	87967	87973	87978	87964	87990	87996	88001	88007	88013	88018
759	88024	88030	88036	88041	88047	88052	88058	88064	88070	88076

A Table of Logarithms from 1 to 10,000.

No.	0	1	2	3	4	5	6	7	8	9
760	88081	88087	88093	88098	88104	88110	88116	88121	88127	88133
761	88138	88144	88150	88156	88161	88167	88173	88178	88184	88190
762	88195	88201	88207	88213	88218	88224	88230	88235	88241	88247
763	88252	88258	88264	88269	88275	88281	88287	88292	88298	88304
764	88309	88315	88321	88326	88332	88338	88343	88349	88355	88360
765	88366	88372	88377	88383	88389	88394	88400	88406	88411	88417
766	88423	88428	88434	88440	88445	88451	88457	88462	88468	88474
767	88479	88485	88491	88496	88502	88508	88513	88519	88525	88530
768	88536	88542	88547	88553	88559	88564	88570	88576	88581	88587
769	88593	88598	88604	88610	88615	88621	88626	88632	88637	88643
770	88649	88655	88660	88666	88672	88677	88683	88688	88694	88700
771	88705	88711	88717	88722	88728	88734	88739	88745	88750	88756
772	88762	88767	88773	88779	88784	88790	88795	88801	88807	88812
773	88818	88824	88829	88835	88840	88846	88852	88857	88863	88868
774	88874	88880	88885	88891	88896	88902	88908	88913	88919	88925
775	88930	88936	88941	88947	88954	88958	88964	88969	88975	88981
776	88986	88992	88997	89003	88009	88014	89020	89025	89031	89036
777	89042	89048	89053	89059	89064	89070	89075	89081	89087	89092
778	89098	89103	89109	89115	89120	89126	89131	89137	89143	89148
779	89154	89159	89165	89170	89176	89182	89187	89193	89198	89204
780	89209	89215	89221	89226	89132	89237	89243	89248	89254	89259
781	89265	89271	89276	89282	89287	89293	89298	89304	89310	89315
782	89321	89326	89332	89337	89243	89348	89354	89359	89365	89371
783	89376	89382	89387	89393	89398	89404	89409	89415	89420	89426
784	89432	89437	89443	89448	89354	89454	89465	89470	89476	89481
785	89487	89492	89498	89504	89409	89515	89520	89526	89531	89537
786	89542	89548	89553	89579	89564	89570	89575	89581	89586	89592
787	89697	89603	89608	89614	89519	89625	89631	89636	89642	89647
788	89653	89658	89664	89669	89675	89680	89686	89691	89697	89702
789	89708	89718	89719	89724	89630	89735	89741	89746	89752	89757
790	89762	89768	89774	89779	89785	89790	89796	89801	89807	89812
791	89818	89823	89829	89834	89740	89845	89851	89856	89861	89867
792	89872	89878	89883	89889	89894	89900	89905	89911	89916	89922
793	89927	89933	89938	89944	89949	89955	89960	89966	89971	89977
794	89982	89987	89993	89998	90004	90009	90015	90020	90026	90031
795	90037	90042	90048	90053	90059	90064	90069	90075	90080	90085
796	90091	90097	90102	90108	90113	90119	90124	90129	90135	90141
797	90146	90151	90157	90162	90168	90173	90178	90184	90189	90195
798	90200	90206	90211	90217	90222	90227	90233	90238	90244	90249
799	90255	90260	90265	90271	90276	90282	90287	90293	90298	90304
800	90309	90314	90320	90325	90331	90336	90342	90347	90352	90358
801	90363	90369	90374	90379	90385	90390	90396	90401	90407	90412
802	90417	90423	90428	90434	90439	90444	90450	90455	90461	90466
803	90471	90477	90482	90488	90493	90499	90504	90509	90515	90520
804	90526	90531	90536	90542	90547	90553	90558	90563	90569	90574
805	90580	90585	90590	90596	90601	90606	90612	90617	90622	90928
806	90633	90639	90644	90650	90655	90660	90666	90671	90677	90682
807	90687	90693	90698	90703	90709	90714	90720	90725	90730	90736
808	90741	90746	90752	90757	90763	90768	90773	90779	90784	90789
809	90795	90800	90806	90811	90816	90822	90827	90832	90838	90843
810	90848	90854	90859	90865	90870	90875	90881	90886	90891	90897
811	90902	90907	90913	90918	90923	90929	90934	90939	90945	90950
812	90956	90961	90966	90972	90977	90982	90988	90993	90998	91004
813	91009	91014	91020	91025	91030	91036	91041	91046	91052	91057
814	91062	91068	91073	91078	91084	91089	91094	91100	91105	91110
815	91116	91121	91126	91132	91137	91142	91148	91153	91158	91164
816	91169	91174	91180	91185	91190	91196	91201	91206	91212	91217
817	91222	91227	91233	91238	91243	91249	91254	91259	91265	91270
818	91275	91281	91286	91291	91297	91302	91307	91312	91318	91323
819	91328	91334	91339	91344	91350	91355	91360	91365	91371	91376

A Table of Logarithms from 1 to 10,000.

No.	0	1	2	3	4	5	6	7	8	9
820	91381	91387	91392	91397	91403	91408	91413	91418	91424	91429
821	91434	91440	91445	91450	91455	91461	91466	91471	91477	91482
822	91487	91492	91498	91503	91508	91514	91519	91524	91529	91535
823	91540	91545	91550	91556	91561	91566	91572	91577	91582	91587
824	91593	91598	91603	91608	91614	91619	91624	91630	91635	91640
825	91645	91651	91656	91661	91661	91672	91677	91682	91687	91693
820	91698	91703	91708	91714	91719	91724	91729	91735	91740	91745
827	91750	91756	91761	91766	91775	91777	91782	91787	91792	91798
828	91803	91808	91813	91819	91824	91829	91834	91840	91845	91850
829	91855	91861	91866	91871	91876	91882	91887	91892	91897	91902
830	91908	91913	91918	91923	91929	9 934	91939	91944	91950	91955
831	91960	91965	91970	91976	91981	91986	91991	91997	92002	92007
832	92012	92017	92023	92028	92033	92038	92044	92049	92054	92059
833	92064	92070	92075	92080	92085	92091	92096	92101	92106	92111
834	92117	92122	92127	92132	92137	92143	92148	92153	92158	92163
835	92169	92174	92179	92184	92189	92195	92200	92205	92210	92215
836	92221	92226	92231	92236	92241	92247	92252	92257	92262	92267
837	92272	92278	92283	92288	92293	92298	92304	92309	92314	92319
838	92324	92330	92335	92340	92345	92350	92355	92361	92366	92371
839	92376	92381	92386	92392	92397	92402	92407	92412	92418	92423
840	92428	92433	92438	92443	92449	92454	92459	92464	92469	92474
841	92480	92485	92490	92495	92500	92505	92511	92516	92521	92526
842	92531	92536	92541	92547	92552	92557	92562	92567	92572	92578
843	92583	92588	92593	92598	92603	92608	92614	92619	92624	92629
844	92634	92639	92644	92650	92655	92660	92665	92670	92675	92680
845	92686	92691	92696	92701	92706	92711	92716	92722	92727	92732
846	92737	92742	92747	92752	92758	92763	92768	92773	92778	92783
847	92788	92793	92799	92804	92809	92814	92819	92824	92829	92834
848	92840	92845	92850	92855	92860	92865	92870	92875	92880	92886
849	92891	92896	92901	92906	92911	92916	92921	92927	92932	92937
850	92942	92947	92952	92957	92962	92967	92972	92978	92983	92988
851	92993	92998	92003	93008	93013	93018	93024	93029	93034	93039
852	93044	93049	93054	93059	93064	93069	93074	93080	93085	93090
853	93095	93100	93105	93110	93115	93120	93125	93130	93136	93141
854	93146	93151	93156	93161	93166	93171	93176	93181	93186	93191
855	93197	93202	93207	93212	93217	93222	93227	93232	93237	93242
856	93247	93252	93257	93263	93268	93273	93278	93283	93288	93293
857	93298	93303	93308	93313	93318	93323	93328	93333	93339	93344
858	93349	93354	93359	93364	93369	93374	93379	93384	93389	93394
859	93399	93404	93409	93414	93419	93425	93430	93435	93440	93445
860	93450	93455	93460	93465	93470	93475	93480	93485	93490	93495
861	93500	93505	93510	93515	93520	93525	93531	93536	93541	93546
862	93551	93556	93561	93566	93571	93576	93581	93586	93591	93596
863	93601	93606	93611	93616	93621	93626	93631	93636	93041	93646
864	93651	93656	93661	93666	93671	93676	93681	93686	93692	93697
865	93702	93707	93712	93717	93727	93727	93732	93737	93742	93747
866	93752	93757	93762	93767	93772	93777	93782	93787	93792	93797
867	93802	93807	93812	93817	93822	93827	93832	93837	93842	93847
868	93852	93857	93862	93867	93872	93877	93882	93887	93892	93897
869	93902	93907	93912	93917	93922	93927	93932	93937	93942	93947
870	93952	93957	93962	93967	93972	93977	93982	93987	93992	93997
871	94002	94007	94012	94017	94022	94027	94032	94037	94042	94047
872	94052	94057	94061	94067	94072	94076	94081	94086	94091	94096
873	94101	94106	94111	94116	84121	94126	94131	94136	94141	94146
874	94151	94156	94161	94166	94171	94176	94181	94186	94191	94196
875	94201	94206	94211	94216	94221	94226	94230	94235	94240	94245
876	94250	94255	94260	94265	94270	94275	94280	94285	94290	94295
877	94300	94305	94310	94315	94320	94325	94330	94335	94340	94344
878	94349	94354	94359	94364	94369	94374	94379	94384	94389	94394
879	94390	94404	94409	94414	94419	94424	94428	94433	94438	94443

A Table of Logarithms from 1 to 10,000.

No.	0	1	2	3	4	5	6	7	9	8
880	94448	94453	94458	94463	94468	94473	94478	94483	94488	94493
881	94498	94502	94507	94512	94517	94522	94527	94532	94537	94542
882	94547	94552	94557	94562	94566	94571	94576	94581	94586	94591
883	94596	94601	94606	94611	94616	94621	94626	94630	94635	94640
884	94645	94650	94655	94660	94665	94670	94675	94680	94684	94689
885	94694	94699	94704	94709	94714	94719	94724	94729	94734	94738
886	94743	94748	94753	94758	94763	94768	94773	94778	94783	94787
887	94792	94797	94802	94807	94812	94817	94822	94827	94831	94836
888	94841	94846	94851	94856	94861	94866	94871	94875	94880	94885
889	94890	94895	94900	94905	94910	94915	94919	94924	94929	94934
890	94939	94944	94949	94953	94958	94963	94968	94973	94978	94983
891	94988	94993	94997	95002	95007	95012	95017	95022	95027	95031
892	95036	95041	95046	95051	95056	95061	95066	95070	95075	95080
893	95085	95090	95095	95100	95105	95109	95114	95119	95124	95129
894	95134	95139	95143	95148	95153	95158	95163	95168	95173	95177
895	95182	95187	95192	95197	95202	95207	95211	95216	95221	95226
896	95231	95236	95240	95245	95250	95255	95260	95265	95270	95274
897	95279	95284	95289	95294	95299	95303	95308	95313	95318	95323
898	95328	95332	95337	95342	95347	95352	95357	95361	95306	95371
899	95376	95381	95386	95390	95395	95400	95405	95410	95415	95419
900	95424	95429	95434	95439	95443	95448	95453	95458	95463	95468
901	95472	95477	95482	95487	95492	95497	95501	95506	95511	95516
902	95521	95525	95530	95535	95540	95545	95549	95544	95559	95564
903	95569	95574	95578	95583	95588	95593	95598	95602	95607	95612
904	95617	95622	95626	95631	95636	95641	95646	95650	95655	95660
905	95665	95670	95674	95679	95684	95689	95694	95698	95703	95708
906	95713	95718	95722	95727	95732	95737	95742	95736	95751	95756
907	95761	95765	95771	95775	95780	95785	95789	95794	95799	95804
908	95809	95813	95818	95823	95828	95832	95837	95842	95847	95852
909	95856	95861	95866	95871	95875	95880	95885	95890	95895	95899
910	95904	95909	95914	95918	95923	95928	95933	95937	95942	95947
911	95952	95957	95961	95966	95971	95976	95980	95985	95990	95995
912	95999	96004	96009	96014	96018	96023	96028	96033	96038	96042
913	96047	96052	96057	96061	96066	96071	96076	96080	96085	96090
914	96095	96099	96104	96109	96114	96118	96123	96128	96133	96137
915	96142	96147	96152	96156	96161	96165	96171	96175	96180	96185
916	96189	96194	96199	96204	96208	96213	96218	96223	96227	96232
917	96237	96242	96246	96251	96256	96261	96265	96270	96275	96279
918	96284	96289	96293	96398	96303	96307	96313	96317	96322	96327
919	96331	96336	96341	96346	96350	96355	96360	96365	96369	96374
920	96379	96383	96388	96493	96398	96402	96407	96412	96416	96421
921	96426	96431	96435	96440	96445	96449	96454	96459	96464	96468
922	96473	96478	96482	96587	96492	96497	96501	96506	96511	96515
923	96520	96525	96530	96534	96539	96544	96548	96553	96558	96562
924	96567	96572	96577	96681	96586	96591	96595	96600	96605	96619
925	96614	96619	96624	96628	96633	96638	96642	96647	96651	96656
926	96661	96666	96670	96775	96680	96684	96689	96694	96699	96703
927	96708	96713	96717	96722	96727	96741	96732	96741	96745	96750
928	96755	96759	96764	96769	96773	96778	96783	96787	96792	96797
929	96802	96806	96811	96816	96820	96825	96830	96834	96839	96844
930	96848	96853	96858	96862	96867	96872	96876	96881	96886	96890
931	96895	96900	96904	96909	96914	96918	96923	96928	96932	96937
932	96942	96946	96951	96956	96960	96965	96969	96974	96979	96983
933	96988	96993	96997	97002	97007	97011	97016	97021	97025	97030
934	97035	97039	97044	97049	97053	97258	97062	97067	97072	97076
935	97081	97086	97090	97095	97100	97104	97109	97114	97118	97123
939	97128	97132	97137	97141	97146	97151	97155	97260	97165	97169
937	97174	97179	97183	97188	97192	97197	97202	97206	97211	97216
938	97220	97225	97229	97234	97239	97243	97248	97253	97257	97262
939	97267	97271	97276	97280	97285	97290	97294	97199	97303	97308

N°.	0	1	2	3	4	5	6	7	8	9
940	97313	97317	97322	97326	97331	97336	97340	97345	97350	97354
941	97359	97364	97368	97373	97377	97382	97387	97391	97396	97400
942	97405	97410	97414	97419	97423	97438	97433	97437	97442	97447
943	97451	97456	97460	97465	97470	97474	97479	97483	97488	97492
944	97497	97502	97506	97511	97516	97520	97525	97529	97534	97539
945	97543	97548	97552	97557	97562	97566	97571	97575	97580	97584
946	97589	97594	97598	97603	97607	97612	97617	97621	97626	97630
947	97635	97640	97644	97649	97653	97658	97662	97667	97672	97676
948	97681	97685	97690	97694	97699	97704	97708	97713	97717	97722
949	97727	97731	97736	97740	97745	97749	97754	97759	97763	97768
950	97772	97777	97781	97786	97791	97795	97800	97804	97809	97813
951	97818	97823	97827	97832	97836	97841	97845	97850	97855	97859
952	97864	97868	97873	97877	97882	97886	97891	97896	97900	97905
953	97909	97914	97918	97923	97927	97932	97937	97941	97946	97950
954	97955	97959	97964	97968	97973	97978	97982	97987	97999	97996
955	98000	98005	98009	98014	98018	98023	98028	98032	98037	98042
956	98046	98050	98055	98059	98064	98068	98073	98078	98082	98087
957	98091	98096	98100	98105	98109	98114	98118	98123	98127	98132
958	98136	98141	98146	98150	98155	98159	98164	98168	98173	98177
959	98182	98186	98191	98195	98200	98204	98209	98213	98218	98223
960	98227	98232	98236	98241	98245	98250	98254	98259	98263	98268
961	98272	98277	98281	98286	98290	98295	98299	98304	98308	98313
962	98317	98322	98326	98331	98336	98340	98345	98349	98354	98358
963	98363	98367	98372	98376	98381	98385	98389	98394	98399	98403
964	98408	98412	98417	98421	98426	98430	98435	98439	98444	98448
965	98453	98457	98462	98466	98471	98475	98480	98484	98489	98493
966	98498	98502	98507	98511	98516	98520	98525	98529	98534	98538
967	98543	98547	98552	98556	98561	98565	98570	98574	98579	98583
968	98587	98592	98596	98601	98605	98610	98614	98619	98622	98628
969	98632	98637	98641	98646	98650	98655	98659	98664	98668	98673
970	98677	98682	98686	98691	98695	98699	98704	98708	98713	98717
971	98722	98726	98731	98735	98740	98744	98749	98753	98758	98762
972	98767	98771	98776	98780	98784	98789	98793	98798	98802	98807
973	98811	98816	98820	98825	98829	98834	98838	98842	98847	98851
974	98856	98860	98865	98862	98874	98878	98883	98887	98891	98896
975	98900	98905	98909	98914	98918	98923	98927	98932	98936	98940
976	98945	98949	98954	98958	98963	98967	98972	98976	98981	98915
977	98989	98994	98998	99003	99007	99012	99016	99021	99025	99029
978	99034	99038	99043	99047	99052	99056	99060	99065	99069	99074
979	99078	99083	99087	99092	99096	99100	99105	99109	99114	99118
980	99123	99127	99131	99136	99140	99145	99149	99154	99158	99162
981	99167	99171	99176	99180	99185	99189	99193	99198	99202	99207
982	99211	99216	99220	99224	99229	99233	99238	99242	99246	99251
983	99257	99259	99264	99269	99273	99277	99282	99286	99291	99295
984	99299	99204	99308	99313	99317	99322	99326	99330	99335	99339
985	99344	99348	99352	99357	99361	99366	99370	99374	99379	99383
986	99388	99392	99396	99401	99405	99410	99414	99418	99423	99427
987	99437	99436	99440	99445	99449	99454	99458	99462	99467	99471
988	99476	99480	99484	99489	99493	99499	99502	99506	99511	99515
989	99520	99524	99528	99533	99537	99542	99546	99550	99555	99559
990	99563	99568	99572	99577	99581	99585	99590	99594	99599	99603
991	99607	99612	99616	99620	99625	99629	99634	99638	99642	99647
992	99651	99655	99660	99664	99669	99673	99677	99682	99686	99690
993	99695	99699	99704	99708	99712	99717	99721	99725	99730	99734
994	99739	99743	99747	99752	99756	99760	99765	99769	99774	99778
995	99782	99787	99791	99795	99800	99804	99808	99813	99817	99822
696	99826	99830	99835	99839	99843	99848	99852	99856	99861	99865
997	99869	99874	99878	99883	99887	99891	99896	99900	99904	99909
998	99913	99917	99922	99926	99930	99935	99939	99943	99948	99952
999	99956	99961	99965	99971	99974	99978	99983	99987	99961	99996

TAB. II. A Table of Artificial Sines, Tang. and Sec. o Degree.

M.	Sine.	Co-ſine.	Tang.	Co-tang.	Secant.	Co-ſecant	
0	0.00000	10.00000	0.00000	Infinite.	10.00000	Infinite.	60
1	6.46373	10.00000	6.46373	13.53627	10.00000	13.53627	59
2	6.76476	10.00000	6.76476	13.23524	10.00000	13.23524	58
3	6.94085	10.00000	6.94085	13.05915	10.00000	13.05915	57
4	7.06579	10.00000	7.06579	12.93421	10.00000	12.93421	56
5	7.16270	10.00000	7.16270	12.83730	10.00000	12.83730	55
6	7.24188	10.00000	7.24188	12.75812	10.00000	12.75812	54
7	7.30882	10.00000	7.30882	12.69118	10.00000	12.69118	53
8	7.36681	10.00000	7.36682	12.63318	10.00000	12.63318	52
9	7.41797	10.00000	7.41797	12.58203	10.00000	12.58203	51
10	7.46373	10.00000	7.46373	12.53627	10.00000	12.53627	50
11	7.40512	10.00000	7.50512	12.49488	10.00000	12.49488	49
12	7.54291	10.00000	7.54291	12.45709	10.00000	12.45709	48
13	7.57767	10.00000	7.57767	12.42233	10.00000	12.42233	47
14	7.60985	10.00000	7.60986	12.39014	10.00000	12.39015	46
15	7.63982	10.00000	7.63982	12.36018	10.00000	12.36018	45
16	7.66784	10.00000	7.66785	12.33215	10.00000	12.33216	44
17	7.69417	9.99999	7.69418	12.30582	10.00000	12.30583	43
18	7.71900	9.99999	7.71900	12.28100	10.00001	12.28100	42
19	7.74248	9.99999	7.74248	12.25752	10.00001	12.25752	41
20	7.76475	9.99999	7.76476	12.23524	10.00001	12.23525	40
21	7.78594	9.99999	7.78595	12.21405	10.00001	12.21406	39
22	7.80615	9.99999	7.80615	12.19385	10.00001	12.19385	38
23	7.82545	9.99999	7.82546	12.17454	10.00001	12.17455	37
24	7.84393	9.99999	7.84394	12.15606	10.00001	12.15607	36
25	7.86166	9.99999	7.86167	12.13833	10.00001	12.13834	35
26	7.87870	9.99999	7.87871	12.12130	10.00001	12.12130	34
27	7.89509	9.99999	7.89510	12.10490	10.00001	12.10491	33
28	7.92088	9.99999	7.91089	12.08911	10.00001	12.08912	32
29	7.92612	9.99999	7.92613	12.07387	10.00002	12.07388	31
30	7.94084	9.99999	7.94086	12.05914	10.00002	12.05915	30
31	7.95508	9.99998	7.95510	12.04490	10.00002	12.04492	29
32	7.96887	9.99998	7.96889	12.03111	10.00002	12.03113	28
33	7.98223	9.99998	7.98225	12.01775	10.00002	12.01777	27
34	7.99520	9.99998	7.99522	12.00478	10.00002	12.00480	26
35	8.00779	9.99998	8.00781	11.99219	10.00002	11.99221	25
36	8.02002	9.99998	8.02004	11.97996	10.00002	11.97998	24
37	8.03192	9.99997	8.03194	11.96805	10.00003	11.96808	23
38	8.04350	9.99997	8.04353	11.95647	10.00003	11.95650	22
39	8.05478	9.99997	8.05481	11.94519	10.00003	11.94522	21
40	8.06578	9.99997	8.06581	11.93419	10.00003	11.93422	20
41	8.07650	9.99997	7.07653	11.92347	10.00003	11.92350	19
42	8.08696	9.99997	7.08700	11.91300	10.00003	11.91304	18
43	8.09718	9.99997	7.09722	11.90278	10.00003	11.90281	17
44	u.10717	9.99996	7.10720	11.89280	10.00004	11.89283	16
45	8.11693	9.99996	7.11696	11.88304	10.00004	11.88307	15
46	8.12647	9.99996	7.12651	11.87349	10.00004	11.87356	14
47	8.13581	9.99996	7.13585	11.86415	10.00004	11.86419	13
48	8.14495	9.99996	7.14500	11.85500	10.00004	11.85505	12
49	8.15391	9.99996	7.15395	11.84605	10.00004	11.84609	11
50	8.16268	9.99995	7.16273	11.83727	10.00005	11.83732	10
51	8.17128	9.99995	8.17132	11.82867	12.00005	11.82872	9
52	8.17971	9.99995	8.17976	11.82024	12.00005	11.82029	8
53	8.18798	9.99995	8.18804	11.81196	12.00005	11.81202	7
54	8.19610	9.99995	8.19616	11.80384	12.00005	11.80390	6
55	8.20407	9.99994	8.20413	11.79587	12.00006	11.79593	5
56	8.21189	9.99994	8.21195	11.78805	12.00006	11.78811	4
57	8.21958	9.99994	8.21964	11.78036	12.00006	11.78042	3
58	8.22713	9.99994	8.22719	11.77280	12.00006	11.77206	2
59	8.23456	9.99994	8.23462	11.76538	12.00006	11.76544	1
60	8.24186	9.99993	8.24192	11.75808	12.00006	11.75814	0
	Co-ſine.	Sine.	Co-tang.	Tangent.	Co-ſecant	Secant.	M.

89 Degrees.

A Table of Artificial Sines, Tang. and Sec. 1 Degree.

M.	Sine.	Co-Sine.	Tangent.	Co-tang.	Secant.	Co ſecant	
0	8.24185	9.99993	8.24192	11.75808	10.00007	11.75814	60
1	8.24903	9.99993	8.24910	11.75090	10.00007	11.75097	59
2	8.25609	9.99993	8.25616	11.74383	10.00007	11.74391	58
3	8.26304	9.99993	8.26311	11.73688	10.00007	11.73696	57
4	8.26988	9.99992	8.26996	11.73004	10.00007	11.73012	56
5	8.27661	9.99992	8.27669	11.72331	10.00008	11.72339	55
6	8.28324	9.99992	8.28332	11.71668	10.00008	11.71676	54
7	8.28977	9.99992	8.28986	11.71014	10.00008	11.71023	53
8	8.29621	9.99991	8.29629	11.70371	10.00008	11.70379	52
9	8.30255	9.99991	8.30263	11.69737	10.00009	11.69745	51
10	8.30879	9.99991	8.30888	11.69112	10.00009	11.69121	50
11	8.31495	9.99991	8.31505	11.68495	10.00009	11.68505	49
12	8.32103	9.99990	8.32112	11.67888	10.00009	11.67897	48
13	8.32702	9.99990	8.32711	11.67289	10.00000	11.67298	47
14	8.33292	9.99990	8.33302	11.66697	10.00010	11.66708	46
15	8.33875	9.99999	8.33886	11.66114	10.00010	11.66125	45
16	8.34450	9.99989	8.34461	11.65539	10.00011	11.65550	44
17	8.35018	9.99989	8.35029	11.64971	10.00011	11.64982	43
18	8.35578	9.99989	8.35589	11.64410	10.00011	11.64422	42
19	8.36131	9.99989	8.36143	11.63857	10.00011	11.63868	41
20	8.36678	9.99988	8.36689	11.63310	10.00012	11.63322	40
21	8.37217	9.99988	8.37229	11.62771	10.00012	11.62783	39
22	8.37750	9.99988	8.37762	11.62238	10.00012	11.62250	38
23	8.38276	9.99987	8.38289	11.61711	10.00013	11.61724	37
24	8.38796	9.99987	8.38809	11.61191	10.00013	11.61204	36
25	8.39310	9.99987	8.39323	11.60677	10.00013	11.60690	35
26	8.39818	9.99986	8.39831	11.60168	10.00014	11.60182	34
27	8.40320	9.99986	8.40334	11.59666	10.00014	11.59680	33
28	8.40816	9.99986	8.40830	11.59170	10.00014	11.59184	32
29	8.41307	9.99985	8.41321	11.58679	10.00015	11.58693	31
30	8.41792	9.99985	8.41807	11.58193	10.00015	11.58208	30
31	8.42272	9.99985	8.42287	11.57713	10.00015	11.57728	29
32	8.42746	9.99984	8.42762	11.57238	10.00016	11.57254	28
33	8.43216	9.99984	8.43231	11.56768	10.00016	11.56784	27
34	8.43680	9.99984	8.43696	11.56304	10.00016	11.56320	26
35	8.44139	9.99983	8.44156	11.55844	10.00017	11.55861	25
36	8.44594	9.99983	8.44611	11.55389	10.00017	11.55406	24
37	8.45044	9.99983	8.45061	11.54939	10.00017	11.54956	23
38	8.45489	9.99982	8.45507	11.54493	10.00018	11.54510	22
39	8.45930	9.99982	8.45948	11.54052	10.00018	11.54070	21
40	8.46366	9.99982	8.46385	11.53615	10.00018	11.53633	20
41	8.46798	9.99981	8.46817	11.53183	10.00019	11.53201	19
42	8.47226	9.99981	8.47245	11.52755	10.00019	11.52774	18
43	8.47650	9.99980	8.47669	11.52331	10.00019	11.52350	17
44	8.48069	9.99980	8.48089	11.51911	10.00020	11.51931	16
45	8.48485	9.99980	8.48505	11.51495	10.00020	11.51515	15
46	8.48896	9.99979	8.48917	11.51083	10.00021	11.51104	14
47	8.49304	9.99979	8.49325	11.50675	10.00021	11.50696	13
48	8.49708	9.99979	8.49729	11.50271	10.00021	11.50292	12
49	8.50108	9.99978	8.50130	11.49870	10.00022	11.49892	11
50	8.50504	9.99978	8.50527	11.49473	10.00022	11.49495	10
51	8.50897	9.99977	8.50920	11.49080	10.00023	11.49103	9
52	8.51287	9.99977	8.51310	11.48690	10.00023	11.48713	8
53	8.51673	9.99976	8.51696	11.48304	10.00023	11.48328	7
54	8.52055	9.99976	8.52079	11.47921	10.00024	11.47945	6
55	8.52434	9.99976	8.52459	11.47541	10.00024	11.47566	5
56	8.52810	9.99975	8.52835	11.46165	10.00025	11.47190	4
57	8.53183	9.99975	8.53208	11.46795	10.00025	11.46817	3
58	8.53552	9.99974	8.53578	11.46422	10.00026	11.46448	2
59	8.53919	9.99974	8.53945	11.46055	10.00026	11.46081	1
60	8.54282	9.99973	8.54308	11.45692	10.00026	11.45718	0
	Co-ſine.	Sine.	Co-tang.	Tangent.	Co-ſecant.	Secant.	M.

88 Degrees.

A Table of Artificial Sines, Tang. and Sec. 2 Degrees.

M.	Sine.	Co-ſine.	Tangent.	Co-tang.	Secant.	Co-ſecant	
0	8.54282	9.99973	8.54309	11.45692	10.00026	11.45718	60
1	8.54642	9.99973	8.54669	11.45331	10.00027	11.45358	59
2	8.54999	9.99973	8.55027	11.44973	10.00027	11.45000	58
3	8.55354	9.99972	8.55382	11.44618	10,00028	11.44646	57
4	8.55705	9.99972	8.55734	11.44266	10.00028	11.44295	56
5	8.56054	9.99971	8.56083	11.43917	10.00029	11.43946	55
6	8.56400	9.99971	8.56429	11.43572	10.00029	11.43600	54
7	8.56743	9.99970	8.56773	11.43227	10.00030	11.43257	53
8	8.57084	9.99970	8.57114	11.42886	10.00030	11.42916	52
9	8.57421	9.99970	8.57452	11.42548	10.00030	11.46579	51
10	8.57757	9.99969	8.57788	11.42212	10.00031	11.42243	50
11	8.58089	9.99968	8.58121	11.41879	10.00031	11.41911	49
12	8.58419	9.99968	8.58451	11.41549	10.00032	11.41581	48
13	8.58747	9.99967	8.58779	11.41221	10.00032	11.41253	47
14	8.59072	9.99967	8.59105	11.40895	10.00033	11.40927	46
15	8.59395	9.99966	8.59428	11.40572	10.00033	11.40605	45
16	8.59715	9.99966	8.59749	11.40251	10.00034	11.40285	44
17	8.60033	9.99965	8.60068	11.39932	10.00034	11.39967	43
18	8.60349	9.99965	8.60384	11.39616	10.00035	11.39651	42
19	8.60662	9.99964	8.60698	11.39302	10.00035	11.39338	41
20	8.60973	9.99964	8.61009	11.38991	10.00036	11.39027	40
21	8.61282	9.99963	8.61319	11.38681	10.00036	11.38718	39
22	8.61589	9.99963	8.61626	11.38374	10.00037	11.38411	38
23	8.61894	9.99962	8.61931	11.38069	10.00038	11.38061	37
24	8.62196	9.99962	8.62234	11.37766	10.00038	11.37804	36
25	8.62496	9.99961	8.62535	11.37465	10.00039	11.37503	35
26	8.62795	9.99961	8.62834	11.37166	10.00039	11.37205	34
27	8.63091	9.99960	8.63131	11.36869	10.00040	11.36909	33
28	8.63385	9.99960	8.63426	11.36574	10.00040	11.36615	32
29	8.63678	9.99959	8.63718	11.36281	10.00040	11.36322	31
30	8.63968	9.99959	8.64009	11.35991	10.00041	11.36032	30
31	8.64256	9.99958	8.64298	11.35702	10.00042	11.35744	29
32	8.64543	9.99957	8.64585	11.35415	10.00042	11.35457	28
33	8.64827	9.99957	8.64870	11.35130	10.00043	11.35173	27
34	8.65110	9.99956	8.65154	11.34846	10.00044	11.34890	26
35	8.65391	9.99956	8.65435	11.34565	10.00044	11.34609	25
36	8.65670	9.99955	8.65715	11.34285	10.00045	11.34330	24
37	8.65947	9.99955	8.65993	11.34007	10.00045	11.34052	23
38	8.66223	9.99954	8.66269	11.33731	10.00046	11.33775	22
39	8.66497	9.99953	8.66543	11.33457	10.00046	11.33503	21
40	8.66769	9.99953	8.66816	11.33184	10.00047	11.33231	20
41	8.67039	9.99952	8.67087	11.32913	10.00048	11.32961	19
42	8.67308	9.99952	8.67356	11.32644	10.00048	11.32692	18
43	8.67575	9.99951	8.67624	11.32376	10.00049	11.32425	17
44	8.67840	9.99951	8.67890	11.32110	10.00049	11.32160	16
45	8.68104	9.99950	8.68154	11.31846	10.00050	11.31896	15
46	8.68366	9.99949	8.68417	11.31583	10.00051	11.31633	14
47	8.68627	9.99949	8.68678	11.31322	10.00051	11.31373	13
48	8.68886	9.99948	8.68938	11.31062	10.00052	11.31114	12
49	8.69144	9.99947	8.69169	11.30804	10.00052	11.30856	11
50	8.69400	9.99947	8.69453	11.30547	10.00053	10.30600	10
51	8.69654	9.99946	8.69708	11.30292	10.00054	10.30346	9
52	8.69907	9.99946	8.69962	11.30038	10.00054	10.30093	8
53	8.70159	9.99945	8.70214	11.29786	10.00055	10.2984	7
54	8.70409	9.99944	8.70465	11.29535	10.00056	10.29591	6
55	8.70658	9.99944	8.70714	11.29286	10.00056	10.29342	5
56	8.70905	9.99943	8.70962	11.29038	10.00057	10.29895	4
57	8.71151	9.99942	8.71208	11.28792	10.00058	10.28849	3
58	8.71395	9.99942	8.71453	11.28546	10.00058	10.28605	2
59	8.71638	9.99941	8.71697	11.28303	10.00059	10.28361	1
60	8.71880	9.99940	8.71940	11.28060	10.00059	10.28120	0
	Co-ſine.	Sine.	Co-tang.	Tangent.	Co-ſecant.	Secant.	M.

81 Degrees.

A Table of Artificial Sines, Tang. and Sec. 3 Degrees.

M.	Sine.	Co-ſine.	Tangent	Co-tang.	Secant.	Co-ſecant	
0	8.71880	9.99940	8.71940	11.28060	10.00059	10.28120	60
1	8.72120	9.99940	8.72181	11.27819	10.00060	10.27880	59
2	8.72359	9.99939	8.72420	11.27580	10.00061	10.27640	58
3	8.72597	9.99938	8.72659	11.27341	10.00062	10.27403	57
4	8.72834	9.99938	8.72896	11.27104	10.00062	10.27166	56
5	8.73069	9.99937	8.73132	11.26868	10.00063	10.26931	55
6	8.73303	9.99936	8.73366	11.26634	10.00064	10.26697	54
7	8.73535	9.99936	8.73600	11.26400	10.00064	10.26465	53
8	8.73767	9.99935	8.73832	11.26168	10.00065	10.26233	52
9	8.73997	9.99934	8.74063	11.25937	10.00065	10.26003	51
10	8.74226	9.99934	8.74292	11.25708	10.00066	11.25774	50
11	8.74454	9.99933	8.74521	11.25479	10.00067	11.25546	49
12	8.74680	9.99932	8.74748	11.25252	10.00068	11.25320	48
13	8.74905	9.99931	8.74974	11.25026	10.00068	11.25094	47
14	8.75130	9.99931	8.75199	11.24801	10.00069	11.24870	46
15	8.75353	9.99930	8.75423	11.24577	10.00070	11.24647	45
16	8.75575	9.99929	8.75645	11.24355	10.00070	11.24425	44
17	8.75795	9.99929	8.75867	11.24133	10.00071	11.24204	43
18	8.76015	9.99928	8.76087	11.23913	10.00072	11.23985	42
19	8.76234	9.99927	8.76306	11.23693	10.00073	11.23766	41
20	8.76451	9.99926	8.76525	11.23475	10.00073	11.23549	40
21	8.76667	9.99926	8.76742	11.23258	10.00074	11.23332	39
22	8.76883	9.99925	8.76958	11.23042	10.00075	11.23117	38
23	8.77097	9.99924	8.77173	11.22827	10.00076	11.22903	37
24	8.77310	9.99923	8.77387	11.22613	10.00076	11.22690	36
25	8.77522	9.99923	8.77599	11.22400	10.00077	11.22478	35
26	8.77733	9.99922	8.77811	11.22189	10.00078	11.22267	34
27	8.77943	9.99922	8.78022	11.21978	10.00079	11.22057	33
28	8.78152	9.99920	8.78253	11.21768	10.00079	11.21848	32
29	8.78360	9.99920	8.78441	11.21559	10.00080	11.21639	31
30	8.78567	9.99919	8.78649	11.21351	10.00081	11.21432	30
31	8.78774	9.99919	8.78855	11.21145	10.00082	11.21226	29
32	8.78979	9.99917	8.79061	11.20939	10.00083	11.21021	28
33	8.79183	9.99917	8.79266	11.20734	10.00083	11.20817	27
34	8.79386	9.99916	8.79470	11.20530	10.00084	11.20614	26
35	8.79588	9.99915	8.79673	11.20327	10.00085	11.20412	25
36	8.79789	9.99914	8.79875	11.20125	10.00086	11.20211	24
37	8.79990	9.99913	8.80076	11.19924	10.00087	11.10010	23
38	8.80189	9.99913	8.80276	11.19723	10.00087	11.19811	22
39	8.80388	9.99912	8.80476	11.19523	10.00088	11.19612	21
40	8.80585	9.99911	8.80674	11.19326	10.00089	11.19415	20
41	8.80782	9.99910	8.80872	11.19128	10.00090	11.19218	19
42	8.80978	9.99909	8.81068	11.18932	10.00091	11.19022	18
43	8.81173	9.99909	8.81264	11.18736	10.00091	11.18827	17
44	8.81367	9.99908	8.81459	11.18541	10.00092	11.18633	16
45	8.81560	9.99907	8.81653	11.18347	10.00093	11.18440	15
46	8.81752	9.99906	8.81846	11.18154	10.00094	11.18248	14
47	8.81944	9.99905	8.82038	11.17962	10.00095	11.18056	13
48	8.82134	9.99904	8.82230	11.17770	10.00096	11.17866	12
49	8.82324	9.99904	8.8[illegible]420	11.17579	10.00097	11.17676	11
50	8.82513	9.99903	8.82610	11.17390	10.00097	11.17487	10
51	8.82701	9.99902	8.82799	11.17201	10.00098	11.17299	9
52	8.82888	9.99901	8.82987	11.17013	10.00099	11.17112	8
53	8.83075	9.99900	8.83175	11.16825	10.00100	11.16925	7
54	8.83261	9.99899	8.83361	11.16639	10.00101	11.16739	6
55	8.83446	9.99898	8.83547	11.16453	10.00102	11.16554	5
56	8.83630	9.99898	8.83732	11.16268	10.00102	11.16370	4
57	8.83813	9.99897	8.83916	11.16084	10.00103	11.16187	3
58	8.83996	9.99896	8.84100	11.15900	10.00104	11.16004	2
59	8.84177	9.99895	8.84282	11.15717	10.00105	11.15823	1
60	8.84358	9.99894	8.84464	11.15536	10.00106	11.15624	0
	Co-ſine.	Sine.	Co-tang.	Tangent.	Co-ſecant	Secant.	M.

86 Degrees.

A Table of Artificial Sines, Tang. and Sec. 4 Degrees.

M	Sine.	Co-fine.	Tangent.	Co-tang.	Secant.	Co-fecant	
0	8.84358	9.99894	8.84464	11.15536	10.00106	11.15642	60
1	8.84539	9.99893	8.84645	11.15355	10.00107	11.15461	59
2	8.84718	9.99892	8.84826	11.15175	10.00108	11.15282	58
3	8.84897	9.99891	8.85006	11.14995	10.00109	11.13103	57
4	8.85075	9.99890	8.85185	11.14814	10.00109	11.14925	36
5	8.85252	9.99890	8.85363	11.14637	10.00110	11.14748	55
6	8.85429	9.99889	8.85540	11.14460	10.00111	11.14571	54
7	8.85605	9.99888	8.85717	11.14283	10.00112	11.14395	53
8	8.85780	9.99887	8.85893	11.14107	10.00113	11.14220	52
9	8.85955	9.99886	8.86069	11.13931	10.00114	11.14045	51
10	8.86128	9.99885	8.86243	11.13757	10.00115	11.13872	50
11	8.86301	9.99884	8.86417	11.13583	10.00116	11.13699	49
12	8.86474	9.99883	8.86590	11.13409	10.00117	11.13526	48
13	8.86645	9.99882	8.86763	11.13237	10.00118	11.13355	47
14	8.86816	9.99881	8.86935	11.13065	10.00119	11.13183	46
15	8.86987	9.99880	8.87106	11.12894	10.00120	11.13013	45
16	8.87156	9.99879	8.87277	11.12723	10.00120	11.12843	44
17	8.87325	9.99878	8.87447	11.12553	10.00121	11.12674	43
18	8.87494	9.99878	8.87616	11.12384	10.00122	11.12506	42
19	8.87661	9.99877	8.87785	11.12215	10.00123	11.12338	41
20	8.87829	9.99876	8.87953	11.12047	10.00124	11.12171	40
21	8.87995	9.99875	8.88120	11.11880	10.00125	11.12005	39
22	8.88161	9.99874	8.88287	11.11713	10.00126	11.11839	38
23	8.88326	9.99873	8.88433	11.11547	10.00127	11.11674	37
24	8.88490	9.99872	8.88618	11.11381	10.00128	11.11510	36
25	8.88654	9.99871	8.88783	11.11217	10.00129	11.11346	35
26	8.88817	9.99870	8.88948	11.11052	10.00130	11.11183	34
27	8.88980	9.99869	8.89111	11.10889	10.00131	11.11020	33
28	8.89142	9.99868	8.89274	11.10726	10.00132	11.10858	32
29	8.89304	9.99867	8.89437	11.10563	10.00133	11.10696	31
30	8.89465	9.99866	8.89598	11.10402	10.00134	11.10536	30
31	8.89624	9.99865	8.89760	11.10240	10.00135	11.10375	29
32	8.89784	9.99864	8.89920	11.10080	10.00136	11.10216	28
33	8.89943	9.99863	8.90080	11.09920	10.00137	11.10057	27
34	8.90102	9.99862	8.90240	11.09760	10.00138	11.09898	26
35	8.90260	9.99861	8.90399	11.09601	10.00139	11.09740	25
36	8.90417	9.99860	8.90557	11.09443	10.00140	11.09583	24
37	8.90574	9.99859	8.90715	11.09285	10.00141	11.09426	23
38	8.90730	9.99858	8.90872	11.09128	10.00142	11.09270	22
39	8.90885	9.99857	8.91028	11.08971	10.00143	11.09115	21
40	8.91040	9.99856	8.91185	11.08815	10.00144	11.08960	20
41	8.91195	9.99855	8.91349	11.08660	10.00145	11.08805	19
42	8.91349	9.99854	8.91495	11.08505	10.00146	11.08651	18
43	8.91502	9.99853	8.91649	11.08350	10.00147	11.08498	17
44	8.91655	9.99852	8.91803	11.08197	10.00148	11.08345	16
45	8.91807	9.99851	8.91957	11.08043	10.00149	11.08193	15
46	8.91959	9.99849	8.92110	11.07890	10.00150	11.08041	14
47	8.92110	9.99848	8.92262	11.07738	10.00151	11.07890	13
48	8.92261	9.99847	8.92514	11.07586	10.00153	11.07739	12
49	8.92411	9.99846	8.92565	11.07435	10.00154	11.07589	11
50	8.92561	9.99845	8.92716	11.07284	10.00155	11.07439	10
51	8.92710	9.99844	8.92866	11.07134	10.00156	11.07290	9
52	8.92859	9.99843	8.93015	11.06984	10.00157	11.07141	8
53	8.93007	9.99842	8.93165	11.06831	10.00158	11.06993	7
54	8.93154	9.99841	8.93313	11.06687	10.00159	11.06846	6
55	8.9330	9.99840	8.93462	11.06538	10.00160	11.06698	5
56	8.93448	9.99839	8.93609	11.06391	10.00161	11.06552	4
57	8.93594	9.99838	8.93756	11.06243	10.00162	11.06406	3
58	8.93740	9.99837	8.94903	11.06097	10.00163	11.06260	2
59	8.93885	9.99835	8.94049	11.05958	10.00164	11.06115	1
60	8.94030	9.99834	8.94195	11.05805	10.00166	11.05970	0
M	Co.Sine.	Sine.	Co-tang.	Tangent.	Co-fecant	Secant.	M.

85 Degrees.

A Table of Artificial Sines, Tang. and Sec. 5 Degrees.

M.	Sine.	Co-ſine.	Tangent.	Co-tang.	Secant.	Co-ſecant	
0	8.94030	9.99834	8.94195	11.05805	10.00166	11.05970	60
1	8.94174	9.99833	8.94340	11.05660	10.00167	11.05826	59
2	8.94317	9.99832	8.94485	11.05515	10.00168	11.05683	58
3	8.94461	9.99831	8.94629	11.05370	10.00169	11.05539	57
4	8.94603	9.99830	8.94773	11.05227	10.00170	11.05397	56
5	8.94746	9.99829	8.94917	11.05083	10.00171	11.05254	55
6	8.94887	9.99828	8.95060	11.04940	10.00172	11.05113	54
7	8.95029	9.99827	8.95202	11.04798	10.00173	11.04971	53
8	8.95170	9.99825	8.95344	11.04656	10.00174	11.04830	52
9	8.95310	9.99824	8.95486	11.04514	10.00175	11.04690	51
10	8.95450	9.99823	8.95627	11.04373	10.00177	11.04550	50
11	8.95590	9.99822	8.95767	11.04233	10.00178	11.04411	49
12	8.95728	9.99821	8.95907	11.04092	10.00179	11.04272	48
13	8.95867	9.99820	8.96047	11.03953	10.00180	11.04133	47
14	8.96005	9.99819	8.96187	11.03813	10.00181	11.03995	46
15	8.96143	9.99817	8.96325	11.03675	10.00183	11.03857	45
16	8.96280	9.99816	8.96464	11.03536	10.00184	11.03720	44
17	8.96477	9.99815	8.96602	11.03398	10.00185	11.03583	43
18	8.96553	9.99814	8.96739	11.03261	10.00186	11.03447	42
19	8.96689	9.99813	8.96877	11.03123	10.00187	11.03311	41
20	8.96825	9.99812	8.97013	11.02987	10.00188	11.03175	40
21	8.96960	9.99810	8.97150	11.02850	0.00190	11.03040	39
22	8.97095	9.99809	8.97285	11.02714	10.00191	11.02905	38
23	8.9722	9.99808	8.97421	11.02579	10.00192	11.02771	37
24	8.97363	9.99807	8.97556	11.02444	10.00193	11.02637	36
25	8.97496	9.9 806	8.97691	11.02309	10.00 94	10.02504	35
26	8.97629	9.99804	8.97825	11.02175	10.00196	11.02371	34
27	8.97762	9.99803	8.97959	11.02041	10.00197	11.02238	33
28	8.97894	9.99802	8.98092	11.01908	10.00198	11.02106	32
29	8.98026	9.99801	8.98225	11.01775	10.00199	11.01974	31
30	9.98157	9.99800	8.98358	11.01642	10.00200	11.01843	30
31	9.98288	9.99798	8.98490	1 .01510	10.00202	11.01712	29
32	9.984 9	9.99797	8.98622	11.01378	10.00203	11.01581	28
33	9.98549	9.99796	8.98753	11.01247	10.00204	11.01450	27
34	9.98679	9.99795	8.98884	11.01116	10.00205	11.01321	26
35	9.98808	9.99793	8.99015	11.00985	10.00206	11.01192	25
36	9.98937	9.99792	8.99145	11.00855	10.00207	11.01063	24
37	9.99066	9.99791	8.99275	11.00725	10.00208	11.00934	23
38	9.99194	9.99790	8.99405	11.00595	10.00210	11.00806	22
39	9.99322	9.99788	8.99534	11.00466	10.00211	11.00678	21
40	8.99450	9.99787	8.99662	11.00338	10.00213	11.00550	20
41	8.99577	9.99786	8.99791	11.00209	10.00214	11.00423	19
42	8.99704	9.99785	8.99919	11.00081	10.00215	11.00296	18
43	8.99830	9.99783	9.00046	10.99954	10.00216	11.00170	17
44	8.99956	9.99782	9.00174	10.99826	10.00218	11.00044	16
45	9.00082	9.99781	9.00301	10.99699	10.00219	10.99918	15
46	9.00207	9.99780	9.00427	10.99573	10.00220	10.99793	14
47	9.00332	9.99779	9.00553	10.99447	10.00222	10.99668	13
48	9.00456	9.99777	9.00679	10.99321	10.00223	10.99544	12
49	9.00580	9.99775	9.00805	10.99195	10.00224	10.99419	11
50	9.00704	9.99774	9.00930	10.99070	10.00225	10.99296	10
51	9.00828	9.99773	9.01055	10.98945	10.00227	10.99172	9
52	9.00951	9.99772	9.01179	10.98821	10.00228	10.99049	8
53	9.01074	9.99771	9.01303	10.98697	10.00229	10.98926	7
54	9.01199	9.99769	9.01427	10.98573	10.00231	10.98884	6
55	9.01318	9.99768	9.01550	10.98450	10.00232	10.98682	5
56	6.01440	9.99767	9.01673	10.98327	10.00233	10.98560	4
57	9.01561	9.99765	9.01796	10.98204	10.00234	10.98439	3
58	9.01682	9.99764	9.01918	10.98082	10.00236	10.98318	2
59	9.01803	9.99763	9.02040	10.97960	10.00237	10.98197	1
60	9.01932	9.99761	9.02162	10.97838	10.00239	10.98077	0
	Co-ſine.	Sine.	Co-tang.	Tangent.	Co-ſecant	Secant.	M.

84 Degrees.

A Table of Artificial Sines, Tang. and Sec. 6 Degrees.

M.	Sine.	Co-ſine.	Tangent.	Co-tang.	Secant.	Co-ſecant	
0	9.01923	9.99761	9.02162	10.97838	10.00239	10.98076	60
1	9.02043	9.99760	9.02283	10.97717	10.00240	10.97956	59
2	9.02163	9.99759	9.02404	10.97596	10.00241	10.97837	58
3	9.02283	9.99757	9.02525	10.97475	10.00243	10.97717	57
4	9.02402	9.99756	9.02945	10.97354	10.00244	10.97598	56
5	9.02520	9.99755	9.02765	10.97234	10.00245	10.97480	55
6	9.02639	9.99753	9.02885	10.97115	10.00247	10.97361	54
7	9.02757	9.99752	9.03005	10.96995	10.00248	10.97243	53
8	9.02874	9.99751	9.03124	10.96876	10.00249	10.97126	52
9	9.02992	9.99749	9.03242	10.96757	10.00251	10.97008	51
10	9.03109	9.99748	9.03361	10.96639	10.00252	10.96891	50
11	9.03226	9.99747	9.03479	10.96521	10.00253	10.96774	49
12	9.03342	9.99745	9.03597	10.96403	10.00255	10.96658	48
13	9.03458	9.99744	9.03714	10.96286	10.00256	10.96542	47
14	9.03574	9.99742	9.03832	10.96168	10.00257	10.96426	46
15	9.03690	9.99741	9.03948	10.96051	10.00259	10.96310	45
16	9.03805	9.99740	9.04065	10.95935	10.00260	10.96195	44
17	9.03920	9.99738	9.04181	10.95819	10.00262	10.96080	43
18	9.04034	9.99737	9.04297	10.95703	10.00263	10.95966	42
19	9.04149	9.99735	9.04413	10.95587	10.00264	10.95851	41
20	9.04262	9.99734	9.04528	10.95472	10.00266	10.95737	40
21	9.04376	9.99733	9.04643	10.95357	10.00267	10.95624	39
22	9.04489	9.99731	9.04758	10.95242	10.00269	10.95510	38
23	9.04603	9.99730	9.04873	10.95127	10.00270	10.95497	37
24	9.04715	9.99728	9.04987	10.95013	10.00271	10.95385	36
25	9.04828	9.99727	9.05101	10.94899	10.00273	10.95172	35
26	9.04940	9.99726	9.05214	10.94786	10.00274	10.95060	34
27	9.05052	9.99724	9.05328	10.94672	10.00276	10.94948	33
28	9.05164	9.99723	9.05441	10.94559	10.00277	10.94836	32
29	9.05275	9.99721	9.05553	10.94447	10.00279	10.94725	31
30	9.05386	9.99720	9.05666	10.94334	10.00280	10.94614	30
31	9.05497	9.99718	9.05778	10.94222	10.00281	10.94503	29
32	9.05607	9.99717	9.05890	10.94110	10.00283	10.94393	28
33	9.05717	9.99716	9.06002	10.93998	10.00284	10.94283	27
34	9.05827	9.99714	9.06113	10.93887	10.00286	10.94173	26
35	9.05937	9.99713	9.06224	10.93776	10.00287	10.94063	25
36	9.06046	9.99711	9.06335	10.93665	10.00289	10.93954	24
37	9.06155	9.99710	9.06445	10.93555	10.00290	10.93845	23
38	9.06264	9.99708	9.06556	10.93444	10.00292	10.93736	22
39	9.06372	9.99707	9.06665	10.93334	10.00293	10.93628	21
40	9.06481	9.99705	9.06775	10.93225	10.00295	10.93519	20
41	9.06588	9.99704	9.06885	10.93115	10.00296	10.93411	19
42	9.06696	9.99702	9.06994	10.93006	10.00298	10.93304	18
43	9.06804	9.99701	9.07103	10.92897	10.00299	10.93196	17
44	9.06911	9.99699	9.07211	10.92789	10.00301	10.93089	16
45	9.07018	9.99698	9.07320	10.92680	10.00302	10.92982	15
46	9.07124	9.99696	9.07428	10.92572	10.00304	10.92876	14
47	9.07231	9.99695	9.07536	10.92464	10.00305	10.92769	13
48	9.07337	9.99693	9.07643	10.92357	10.00307	10.92663	12
49	9.07442	9.99692	9.07750	10.92249	10.00308	10.92558	11
50	9.07548	9.99690	9.07858	10.92142	10.00310	10.92452	10
51	9.07653	9.99689	9.07964	10.92036	10.00311	10.92347	9
52	9.07758	9.99687	9.08071	10.91929	10.00313	10.92242	8
53	9.07863	9.99686	9.08177	10.91823	10.00314	10.92137	7
54	9.07968	9.99684	9.08283	10.91717	10.00316	10.92032	6
55	9.08072	9.99683	9.08389	10.91611	10.00317	10.91928	5
56	9.08176	9.99681	9.08495	10.91505	10.00316	10.91824	7
57	9.08280	9.99680	9.08601	10.91400	10.00320	10.91720	3
58	9.08383	9.99678	9.08705	10.91295	10.00322	10.91617	2
59	9.08486	9.99677	9.08810	10.91190	10.00323	10.91514	1
60	9.08589	9.99675	9.08914	10.91086	10.00325	10.91411	0
	Co-ſine.	Sine.	Co-tang.	Tangent.	Co-ſecant	Secant.	M.

83 Degrees.

A Table of Artificial Sines, Tang. and Sec. 7 Degrees.

M.	Sine.	Co-ſine,	Tangen..	Co-tang.	Secant.	Co-ſecant	
0	9.08589	9.99675	9.08914	10.91086	10.00325	10.91411	60
1	9.08692	9.99673	9.09019	10.90981	10.00326	10.91308	59
2	9.08795	9.99672	9.09123	10.90877	10.00328	10.91205	58
3	9.08897	9.99670	9.09227	10.90773	10.00330	10.91103	57
4	9.08999	9.99669	9.09330	10.90670	10.00331	10.91001	56
5	9.09101	9.99667	9.09434	10.90566	10.00333	10.90899	55
6	9.09202	9.99666	9.09537	10.90463	10.00334	10.90798	54
7	9.09304	9.99664	9.09640	10.90360	10.00336	10.90696	53
8	9.99405	9.99662	9.09742	10.90258	10.00337	10.90595	52
9	9.09506	9.99661	9.09845	10.90155	10.00339	10.90494	51
10	9.09606	9.99659	9.09947	10.90053	10.00341	10.90394	50
11	9.09706	9.99658	9.10049	10.89951	10.00342	10.90293	49
12	9.09807	9.99656	9.10150	10.89850	10.00344	10.90193	48
13	9.09906	9.99655	9.10252	10.89748	10.00345	10.90093	47
14	9.10006	9.99653	9.10353	10.89647	10.00347	10.89994	46
15	9.10106	9.99651	9.10454	10.89546	10.00349	10.89894	45
16	9.10205	9.99650	9.10555	10.89445	10.00350	10.89795	44
17	9.10304	9.99648	9.10656	10.89344	10.00352	10.89696	43
18	9.10402	9.99647	9.10756	10.89244	10.00353	10.89597	42
19	9.10501	9.99645	9.10856	10.89144	10.00355	10.89499	41
20	9.10599	9.99643	9.10956	10.89044	10.00357	10.89401	40
21	9.10697	9.99642	9.11056	10.88944	10.00358	10.89303	39
22	9.10795	9.99640	9.11155	10.88845	10.00360	10.89205	38
23	9.10893	9.99638	9.11254	10.88746	10.00362	10.89107	37
24	9.10990	9.99637	9.11353	10.88647	10.00363	10.89010	36
25	9.11087	9.99635	9.11452	10.88548	10.00365	10.88913	35
26	9.11184	9.99633	9.11551	10.88449	10.00366	10.88816	34
27	9.11281	9.99632	9.11649	10.88351	10.00368	10.88719	33
28	9.11377	9.99630	9.11747	10.88253	10.00370	10.88623	32
29	9.11474	9.99628	9.11845	10.88155	10.00371	10.88526	31
30	9.11570	9.99627	9.11943	10.88057	10.00373	10.88430	30
31	9.11666	9.99625	9.12040	10.87960	10.00375	10.88334	29
32	9.11761	9.99623	9.12138	10.87862	10.00376	10.88239	28
33	9.11857	9.99622	9.12235	10.87765	10.00378	10.88143	27
34	9.11952	9.99620	9.12332	10.87668	10.00380	10.88048	26
35	9.12047	9.99618	9.12428	10.87572	10.00381	10.87953	25
36	9.12142	9.99617	9.12525	10.87475	10.00383	10.87858	24
37	9.12236	9.99615	9.12621	10.87379	10.00385	10.87764	23
38	9.12331	9.99613	9.12717	10.87283	10.00307	10.87669	22
39	9.12425	9.99612	9.12813	10.87187	10.00388	10.87575	21
40	9.12519	9.99610	9.12909	10.87091	10.00390	10.87481	20
41	9.12612	9.99608	9.13004	10.86996	10.00392	10.87387	19
42	9.12706	9.99607	9.13099	10.86901	10.00393	10.87294	18
43	9.12799	9.99605	9.13194	10.86806	10.00398	10.87201	17
44	9.12892	9.99603	9.13289	10.86711	10.00397	10.87107	16
45	9.12985	9.99601	9.13384	10.86616	10.00398	10.87015	15
46	9.13078	9.99600	9.13478	10.86522	10.00400	10.86922	14
47	9.13171	9.99598	9.13573	10.86427	10.00402	10.86829	13
48	9.13263	9.99596	9.13667	10.86333	10.00404	10.86737	12
49	9.13355	9.99595	9.13760	10.86239	10.00405	10.86645	11
50	9.13447	9.99593	9.13854	10.86146	10.00407	10.86553	10
51	9.13539	9.99591	9.13948	10.86052	10.00409	10.86461	9
52	9.13630	9.99589	9.14041	10.85959	10.00411	10.86370	8
53	9.13722	9.99588	9.14134	10.85866	10.00412	20.86278	7
54	9.13813	9.99586	9.14227	10.85773	10.00414	10.86187	6
55	9.13904	9.99584	9.14320	10.85680	10.00416	10.86096	5
56	9.13994	9.99582	9.14412	10.85588	10.00418	10.86006	4
57	9.14085	9.99581	9.14504	10.85496	10.00419	10.85915	3
58	9.14175	9.99579	9.14596	10.85403	10.00421	10.85825	2
59	9.14266	9.99577	9.14688	10.85311	10.00423	10.85734	1
60	9.14356	9.99575	9.14780	10.85220	10.00425	10.85644	0
	Co-ſine.	Sine.	Co-tang.	Tangent.	Co-ſecant	Secant.	M.

82 Degrees.

A Table of Artificial Sines, Tang. and Sec. 8 Degrees.

M.	Sine.	Co-ſine.	Tangent.	Co-tang.	Secant.	Co-ſecant	
0	9.14356	9.99575	9.14780	10.85220	10.00425	10.85644	60
1	9.14445	9.99573	9.14872	10.85128	10.00426	10.85555	59
2	9.14535	9.99572	9.14963	10.85037	10.00428	10.85465	58
3	9.14624	9.99570	9.15054	10.84946	10.00430	10.85376	57
4	9.14714	9.99568	9.15145	10.84855	10.00432	10.85286	56
5	9.14803	9.99566	9.15236	10.84764	10.00434	10.85197	55
6	9.14891	9.99565	9.15327	10.84673	10.00435	10.85108	54
7	9.14980	9.99563	9.15417	10.84583	10.00437	10.85020	53
8	9.15069	9.99561	9.15508	10.84492	10.00439	10.84931	52
9	9.15157	9.99559	9.15598	10.84402	10.00441	10.84843	51
10	9.15245	9.99557	9.15688	10.84312	10.00443	10.84755	50
11	9.15333	9.99555	9.15777	10.84222	10.00444	10.84667	49
12	9.15421	9.99554	9.15867	10.84133	10.00446	10.84579	48
13	9.15508	9.99552	9.15956	10.84043	10.00448	10.84492	47
14	9.15596	9.99550	9.16046	10.83954	10.00450	10.84404	46
15	9.15683	9.99548	9.16135	10.83865	10.00452	10.84317	45
16	9.15770	9.99546	9.16224	10.83776	10.00454	10.84230	44
17	9.15857	9.99545	9.16312	10.83688	10.00455	10.84143	43
18	9.15943	9.99543	9.16401	10.83599	10.00457	10.84056	42
19	9.16030	9.99541	9.16489	10.83511	10.00459	10.83970	41
20	9.16116	9.99539	9.16577	10.83423	10.00461	10.83884	40
21	9.16203	9.99537	9.16665	10.83335	10.00463	10.83797	39
22	9.16289	9.99535	9.16753	10.83247	10.00465	10.83711	38
23	9.16374	9.99533	9.16841	10.83159	10.00467	10.83626	37
24	9.16460	9.99532	9.16928	10.83072	10.00468	10.83540	36
25	9.16545	9.99530	9.17016	10.82984	10.00470	10.83455	35
26	9.16631	9.99528	9.17103	10.82897	10.00472	10.83369	34
27	9.16716	9.99526	9.17190	10.82810	10.00474	10.83284	33
28	9.16801	9.99524	9.17277	10.82723	10.00476	10.83199	32
29	9.16886	9.99522	9.17363	10.82637	10.00478	10.83114	31
30	9.16970	9.99520	9.17450	10.82550	10.00480	10.83030	30
31	9.17055	9.99518	9.17536	10.82464	10.00482	10.82945	29
32	9.17139	9.99517	9.17622	10.82378	10.00483	10.82861	28
33	9.17223	9.99515	9.17708	10.82292	10.00485	10.82777	27
34	9.17307	9.99513	9.17794	10.82206	10.00487	10.82693	26
35	9.17391	9.99511	9.17880	10.82120	10.00489	10.82609	25
39	9.17474	9.99509	9.17965	10.82034	10.00491	10.82526	24
37	9.17558	9.99507	9.18051	10.81949	10.00493	10.82442	23
38	9.17641	9.99505	9.18136	10.81864	10.00495	10.82359	22
39	9.17724	9.99503	9.18221	10.81779	10.00497	10.82276	21
40	9.17807	9.99501	9.18306	10.81694	10.00499	10.82193	20
41	9.17890	9.99499	9.18391	10.81609	10.00501	10.82110	19
42	9.17973	9.99497	9.18475	10.81525	10.00503	10.82027	18
43	9.18055	9.99495	9.18560	10.81440	10.00504	10.81945	17
44	9.58137	9.99493	9.18644	10.81356	10.00506	10.81863	16
45	9.18220	9.99492	9.18728	10.81272	10.00508	10.81780	15
46	9.18302	9.99490	9.18812	10.81188	10.00510	10.81698	14
47	9.18383	9.99488	9.188 6	10.81104	10.00512	10.81617	13
48	9.18465	9.99486	9.18979	10.81021	10.00514	10.81535	12
49	9.18547	9.99484	9.19063	10.8093	10.00516	10.81453	11
50	9.18628	9.99482	9.19146	10.80854	10.00518	10.81372	10
51	9.18709	9.99480	9.19229	10.80771	10.00520	10.81291	9
52	9.18790	9.99478	9.19312	10.80688	10.00522	10.81210	8
53	9.18871	9.99476	9.19395	10.80605	10.00524	10.81129	7
54	9.18952	9.99474	9.1947	10.80522	10.00526	10.81048	6
55	9.19033	9.99472	9.19561	10.80436	10.00528	10.8096-	5
56	9.19113	9.99470	9.19643	10.80357	10.00530	10.80887	4
57	9.19193	9.99468	9.19725	10.80275	10.00532	10.80807	3
58	9.19273	9.99466	9.19807	10.80193	10.00534	10.80727	2
59	9.19353	9.99464	9.19889	10.80111	10.00536	10.80647	1
60	9.19433	9.99462	9.19971	10.80029	10.00538	10.80567	0
	Co-ſine.	Sine.	Co-tang.	Tangent.	Co-ſecant	Secant.	M.

81 Degrees.

A Table of Artificial Sines, Tang. and Sec. 9 Degrees.

M.	Sine.	Co-fine.	Tangent.	Co-tang.	Secant.	Co-fecan.	
0	9.19433	9.99462	9.19971	10.80029	10.00538	10.80567	60
1	9.19513	9.99460	9.20053	10.79947	10.00540	10.80487	59
2	9.19592	9.99458	9.20134	10.79865	10.00542	10.80408	58
3	9.19672	9.99456	9.20216	10.79784	10.00544	10.80328	57
4	9.19751	9.99454	9.20297	10.79703	10.00546	10.80249	56
5	9.19830	9.99452	9.20378	10.79621	10.00548	10.80170	55
6	9.19909	9.99450	9.20459	10.79541	10.00550	10.80091	54
7	9.19988	9.99448	9.20540	10.79460	10.00552	10.80012	53
8	9.20067	9.99446	9.20621	10.79379	10.00554	10.79933	52
9	9.20145	9.99444	9.20701	10.79299	10.00556	10.79855	51
10	9.20223	9.99442	9.20782	10.79218	10.00558	10.79777	50
11	9.20302	9.99440	9.20862	10.79138	10.00560	10.79698	49
12	9.20380	9.99438	9.20942	10.79058	10.00562	10.79 20	48
13	9.20458	9.99436	9.21022	10.78978	10.00564	10.79542	47
14	9.20535	9.99434	9.21102	10.78898	10.00566	10.79465	46
15	9.20613	9.99432	9.21181	10.78818	10.00568	10.79387	45
16	9.20691	9.99429	9.21261	10.78739	10.00570	10.79309	44
17	9.20768	9.99427	9.21340	10.78659	10.00573	10.79232	43
18	9.20845	9.99425	9.21420	10.78580	10.00575	10.79155	42
19	9.20922	9.99423	9.21499	10.78501	10.00577	10.79078	41
20	9.20999	9.99421	9.21578	10.78422	10.00579	10.79001	40
21	9.21076	9.99419	9.21657	10.78343	10.00581	10.78924	39
22	9.21153	9.99417	9.21736	10.78264	10.00583	10.78847	38
23	9.21229	9.99415	9.21814	10.78186	10.00585	10.78771	37
24	9.21305	9.99413	9.21893	10.78107	10.00587	10.78694	36
25	9.21382	9.99411	9.21971	10.78029	10.00589	10.78618	35
26	9.21458	9.99409	9.22049	10.77951	10.00591	10.78542	34
27	9.21534	9.99407	9.22127	10.77873	10.00593	10.78466	33
28	9.21610	9.99404	9.22205	10.77795	10.00595	10.78390	32
29	9.21685	9.99402	9.22283	10.77717	10.00598	10.78315	31
30	9.21761	9.99400	9.22361	10.77639	10.00600	10.78239	30
31	9.21836	9.99398	9.22438	10.77562	10.00602	10.78164	29
32	9.21912	9.99396	9.22516	10.77484	10.00604	10.78088	28
33	9.21987	9.99394	9.22593	10.77407	10.00606	10.78013	27
34	9.22062	9.99392	9.22670	10.77330	10.00608	10.77938	26
35	9.22137	9.99390	9.22747	10.77253	10.00610	10.77863	25
36	9.22211	9.99388	9.22824	10.77177	10.00612	10.77788	24
37	9.22286	9.99385	9.22901	10.77099	10.00615	10.77714	23
38	9.22361	9.99383	9.22977	10.77022	10.00617	10.77630	22
39	9.22435	9.99381	9.23054	10.76946	10.00619	10.77565	21
40	9.22509	9.99379	9.23130	10.76870	1.000621	10.77491	20
41	9.22583	9.99377	9.23206	10.76793	1.000623	10.77417	19
42	9.22657	9.99375	9.23283	10.76717	1.000625	10.77343	18
43	9.22731	9.99372	9.23355	10.76641	10.00628	10.77269	17
44	9.22805	9.99370	9.23435	10.7 565	10.00630	10.77195	16
45	9.22878	9.99368	9.23510	10.76490	10.00632	10.77122	15
46	9.22952	9.99366	9.23586	10.76414	10.00634	10.77048	14
47	9.23025	9.99364	9.23661	10.76339	10.00636	10.76975	13
48	9.23098	9.99362	9.23737	10.76263	10.00638	10.76902	12
49	9.23171	9.99359	9.23812	10.76188	10.00641	10.76829	11
50	9.23244	9.99357	9.23887	10.76113	10.00643	10.76756	10
51	9.23317	9.99355	9.23962	10.76038	10.00645	10.76683	9
52	9.23390	9.99353	9.24037	10.75963	10.00647	10.76610	8
53	9.23462	9.99351	9.24112	10.75888	10.00649	10.76538	7
54	9.23535	9.99348	9.24186	10.75813	10.00652	10.76465	6
55	9.23607	9.99346	9.24261	10.75739	10.00654	10.76393	5
56	9.23679	9.99344	9.24335	10.75665	10.00656	10.76321	7
57	9.23751	9.99342	9.24410	10.75590	10.00658	10.76248	3
58	9.23823	9.99340	9.24484	10.75516	10.00660	10.76177	2
59	9.2 895	9.99337	9.24553	10.75442	10.00663	10.76105	1
60	9.23967	9.99335	9.24633	10.75368	10.00665	10.76033	0
	Co-fine.	Sine.	Co-tang.	Tangent.	Co-fecant	Secant.	M.

D   80 Degrees.

A Table of Artificial Sines, Tang. and Sec. 10 Degrees,

M.	Sine.	Co-ſine.	Tangent.	Co-tang.	Secant.	Co-ſecant	
0	9.23967	9.99335	9.24632	10.75368	10.00665	10.76033	60
1	9.24039	9.99333	9.24706	10.75294	10.00667	10.75961	59
2	9.24111	9.99331	9.24779	10.75221	10.00669	10.75890	58
3	9.24181	9.99328	9.24853	10.75147	10.00672	10.75819	57
4	9.24253	9.99326	9.24926	10.75074	10.00674	10.75747	56
5	9.24324	9.99324	9.25000	10.75000	10.00676	10.75676	55
6	9.24365	9.99322	9.25073	10.74927	10.00678	10.75605	54
7	9.24466	9.99319	9.25146	10.74854	10.00680	10.75534	53
8	9.24536	9.99317	9.25219	10.74781	10.00683	10.75464	52
9	9.24607	9.99315	9.25292	10.74708	10.00685	10.75393	51
10	9.24677	9.99313	9.25365	10.74635	10.00687	10.75322	50
11	9.24748	9.99310	9.25437	10.74563	10.00690	10.75262	49
12	9.24818	9.99308	9.25510	10.74490	10.00692	10.75182	48
13	9.24888	9.99306	9.25582	10.74418	10.00694	10.75112	47
14	9.24958	9.99304	9.25655	10.74345	10.00696	10.75042	46
15	9.25028	9.99301	9.25727	10.74273	10.00699	10.74972	45
16	9.25098	9.99299	9.25799	10.74201	10.00701	10.74902	44
17	9.25168	9.99297	9.25871	10.74129	10.00703	10.74832	43
18	9.25237	9.99294	9.25943	10.74057	10.00706	10.74762	42
19	9.25307	9.99292	9.26015	10.73985	10.00708	10.74693	41
20	9.25376	9.99290	9.26086	10.73914	10.00710	10.74623	40
21	9.25445	9.99288	9.26158	10.73842	10.00712	10.74555	39
22	9.25514	9.99285	9.26229	10.73771	10.00715	10.74486	38
23	9.25583	9.99283	9.26300	10.73699	10.00717	10.74417	37
24	9.25652	9.99281	9.26372	10.73628	10.00719	10.74348	36
25	9.25721	9.99278	9.26443	10.73557	10.00722	10.74279	35
26	9.25790	9.99276	9.26514	10.73486	10.00724	10.74210	34
27	9.25857	9.99274	9.26585	10.73415	10.00726	10.74142	33
28	9.25928	9.99271	9.26655	10.73344	10.00729	10.74073	32
29	9.25995	9.99269	9.26726	10.73274	10.00731	10.74005	31
30	9.26063	9.99267	9.26797	10.73203	10.00733	10.73937	30
31	9.26131	9.99264	9.26867	10.73133	10.00736	10.73869	29
32	9.26199	9.99262	9.26937	10.73063	10.00738	10.73801	28
33	9.26267	9.99260	9.27008	10.72992	10.00741	10.73733	27
34	9.26335	9.99257	9.27078	10.72922	10.00743	10.73665	26
35	9.26403	9.99255	9.27148	10.72852	10.00745	10.73597	25
36	9.26470	9.99252	9.27218	10.72782	10.00747	10.73530	24
37	9.26538	9.99250	9.27288	10.72712	10.00750	10.73462	23
38	9.26605	9.99248	9.27357	10.72643	10.00752	10.73365	22
39	9.26672	9.99245	9.27427	10.72573	10.00755	10.73328	21
40	9.26739	9.99243	9.27496	10.72504	10.00757	10.73261	20
41	9.26806	9.99241	9.27566	10.72434	10.00759	10.73193	19
42	9.26873	9.99238	9.27635	10.72365	10.00762	10.73127	18
43	9.26940	9.99236	9.27704	10.72296	10.00764	10.73060	17
44	9.27007	9.99233	9.27773	10.72227	10.00766	10.72993	16
45	9.27073	9.99231	9.27842	10.72158	10.00769	10.72926	15
46	9.27140	9.99229	9.27911	10.72089	10.00771	10.72860	14
47	9.27206	9.99226	9.27980	10.72020	10.00774	10.72794	13
48	9.27273	9.99224	9.28049	10.71951	10.00776	10.72727	12
49	9.27339	9.99221	9.28117	10.71883	10.00779	10.72661	11
50	9.27405	9.99219	9.28186	10.71814	10.00781	10.72595	10
51	9.27471	9.99217	9.28254	10.71746	10.00783	10.72529	9
52	9.27537	9.99214	9.28322	10.71677	10.00786	10.72463	8
53	9.27602	9.99212	9.28391	10.71609	10.00788	10.72398	7
54	9.27668	9.99209	9.28459	10.71541	10.00791	10.72332	6
55	9.27734	9.99207	9.28527	10.71473	10.00793	10.72266	5
56	9.27799	9.99204	9.28595	10.71405	10.00796	10.72201	4
57	9.27864	9.99202	9.28662	10.71338	10.00798	10.72136	3
58	9.27930	9.99200	9.28730	10.71270	10.00800	10.72070	2
59	9.27995	9.99197	9.28798	10.71202	10.00803	10.72005	1
60	9.28060	9.99195	9.28865	10.71135	10.00805	10.71940	0
	Co-ſine.	Sine.	Co-tang.	Tangent.	Co-ſecant	Secant.	M.

79 Degrees.

A Table of Artificial Sines, Tang. and Sec. 11 Degrees.

M.	Sine.	Co-ſine.	Tangen .	Co-tang.	Secant.	Co-ſecant	
0	9.28060	9.99195	9.28865	10.71135	10.00805	10.71940	60
1	9.28125	9.99192	9.28933	10.71067	10.00808	10.71875	59
2	9.28190	9.99190	9.29000	10.71000	10.00810	10.71810	58
3	9.28254	9.99187	9.29067	10.70933	10.00813	10.71746	57
4	9.28319	9.99185	9.29134	10.70866	10.00815	10.71681	56
5	9.28384	9.99182	9.29201	10.70799	10.00818	10.71616	55
6	9.28448	9.99180	9.29268	10.70732	10.00820	10.71552	54
7	9.28512	9.99177	9.29335	10.70665	10.00823	10.71488	53
8	9.28577	9.99175	9.29402	10.70598	10.00825	10.71423	52
9	9.28641	9.99172	9.29468	10.70532	10.00828	10.71359	51
10	9.28705	9.99170	9.29535	10.70465	10.00830	10.71295	50
11	9.28769	9.99167	9.29601	10.70399	10.00833	10.71231	49
12	9.28833	9.99165	9.29668	10.70332	10.00835	10.71167	48
13	9.28896	9.99162	9.29734	10.70266	10.00838	10.71104	47
14	9.28960	9.99160	9.29800	10.70200	10.00840	10.71040	46
15	9.29024	9.99157	9.29866	10.70134	10.00843	10.70975	45
16	9.29087	9.99155	9.29932	10.70068	10.00845	10.70913	44
17	9.29150	9.99152	9.29998	10.70002	10.00848	10.70850	43
18	9.29214	9.99150	9.30064	10.69936	10.00850	10.70786	42
19	9.29277	9.99147	9.30130	10.69870	10.00853	10.70723	41
20	9.29340	9.99145	9.30195	10.69805	10.00855	10.70660	40
21	9.29403	9.99142	9.30261	10.69739	10.00858	10.70597	39
22	9.29466	9.99140	9.30326	10.69674	10.00860	10.70534	38
23	9.29529	9.99137	9.30391	10.69609	10.00863	10.70471	37
24	9.29591	9.99135	9.30457	10.69543	10.00865	10.70409	36
25	9.29654	9.99132	9.30522	10.69478	10.00868	10.70346	35
26	9.29716	9.99130	9.30587	10.69413	10.00870	10.70284	34
27	9.29779	9.99127	9.30652	10.69348	10.00873	10.70221	33
28	9.29841	9.99124	9.30717	10.69283	10.00876	10.70159	32
29	9.29903	9.99122	9.30782	10.69218	10.00878	10.70097	31
30	9.29966	9.99119	9.30846	10.69154	10.00881	10.70034	30
31	9.30028	9.99117	9.30911	10.69089	10.00883	10.69972	29
32	9.30090	9.99114	9.30975	10.69025	10.00886	10.69910	28
33	9.30151	9.99112	9.31040	10.68960	10.00888	10.69849	27
34	9.30213	9.99109	9.31104	10.68896	10.00891	10.69787	26
35	9.30275	9.99106	9.31168	10.68831	10.00894	10.69725	25
36	9.30336	9.99104	9.31233	10.68767	10.00896	10.69664	24
37	9.30398	9.99101	9.31297	10.68703	10.00899	10.69602	23
38	9.30459	9.99099	9.31361	10.68639	10.00901	10.69541	22
39	9.30521	9.99096	9.31424	10.68575	10.00904	10.69479	21
40	9.30582	9.99093	9.31489	10.68511	10.00907	10.69418	20
41	9.30643	9.99091	9.31552	10.68448	10.00909	10.69357	19
42	9.30704	9.99088	9.31616	10.68384	10.00912	10.69296	18
43	9.30765	9.99086	9.31679	10.68320	10.00914	10.69235	17
44	9.30826	9.99083	9.31743	10.68257	10.00917	10.69174	16
45	9.30887	9.99080	9.31806	10.68194	10.00920	10.69113	15
46	9.30947	9.99078	9.31870	10.68130	10.00922	10.69053	14
47	9.31008	9.99075	9.31933	10.68067	10.00925	10.68992	13
48	9.31068	9.99072	9.31996	10.68004	10.00928	10.68931	12
49	9.31129	9.99070	9.32059	10.67981	10.00930	10.68871	11
50	9.31189	9.99067	9.32122	10.67878	10.00933	10.68811	10
51	9.31249	9.99064	9.32185	10.67815	10.00936	10.68750	9
52	9.31310	9.99062	9.32248	10.67752	10.00938	10.68690	8
53	9.31370	9.99059	9.32311	10.67689	10.00941	10.68630	7
54	9.31430	9.99056	9.32373	10.67627	10.00944	10.68570	6
55	9.31490	9.99054	9.32436	10.67564	10.00946	10.68510	5
56	9.31549	9.99051	9.32498	10.67502	10.00949	10.68451	4
57	9.31609	9.99048	9.32561	10.67439	10.00952	10.68391	3
58	9.31669	9.99046	9.32623	10.67377	10.00954	10.68331	2
59	9.31728	9.99043	9.32685	10.67315	10.00957	10.68272	1
60	9.31788	9.99040	9.32747	10.67252	10.00960	10.68212	0
	Co-ſine.	Sine.	Co-tang.	Tangent.	Co-ſecant.	Secant.	M.

78 Degrees.

A Table of Artificial Sines, Tang. and Sec. 12 Degrees.

M.	Sine.	Co-Sine.	Tangent.	Co-tang.	Secant.	Co-ſecant	
0	9.31788	9.99040	9.32747	10.67253	10.00960	10.68212	60
1	9.31847	9.99038	9.32810	10.67219	10.00962	10.68153	59
2	9.31907	9.99035	9.32872	10.67128	10.00965	10.68093	58
3	9.31966	9.99032	9.32933	10.67067	10.00968	10.68034	57
4	9.32025	9.99030	9.32995	10.67005	10.00970	10.67975	56
5	9.32084	9.99027	9.33057	10.67943	10.00973	10.67916	55
6	9.32143	9.99024	9.33119	10.66881	10.00976	10.67857	54
7	9.32202	9.99022	9.33180	10.66820	10.00978	10.67798	53
8	9.32261	9.99019	9.33242	10.66758	10.00981	10.67739	52
9	9.32319	9.99016	9.33303	10.66697	10.00984	10.67681	51
10	9.32378	9.99013	9.33365	10.66635	10.00987	10.67622	50
11	9.32437	9.99011	9.33426	10.66574	10.00989	10.67563	49
12	9.32495	9.99008	9.33487	10.66513	10.00992	10.67505	48
13	9.32553	9.99005	9.33548	10.66452	10.00995	10.67447	47
14	9.32612	9.99002	9.33609	10.66391	10.00998	10.67388	46
15	9.32670	9.99000	9.33670	10.66330	10.01000	10.67330	45
16	9.32728	9.98997	9.33731	10.66269	10.01003	10.67272	44
17	9.32786	9.98994	9.33792	10.66208	10.01006	10.67214	43
18	9.32844	9.98991	9.33853	10.66147	10.01009	10.67156	42
19	9.32902	9.98989	9.33913	10.66087	10.01011	10.67098	41
20	9.32960	9.98986	9.33974	10.66026	10.01014	10.67040	40
21	9.33018	9.98983	9.34034	10.65966	10.01017	10.66982	39
22	9.33075	9.98980	9.34095	10.65905	10.01020	10.66925	38
23	9.33133	9.98978	9.34155	10.65845	10.01022	10.66867	37
24	9.33190	9.98975	9.34215	10.65784	10.01025	10.66810	36
25	9.33248	9.98972	9.34276	10.65724	10.01028	10.66752	35
26	9.33305	9.98969	9.34336	10.65664	10.01031	10.66695	34
27	9.33362	9.98967	9.34396	10.65604	10.01033	10.66638	33
28	9.33420	9.98964	9.34456	10.65544	10.01036	10.66580	32
29	9.33477	9.98961	9.34516	10.65484	10.01039	10.66523	31
30	9.33534	9.98958	9.34576	10.65424	10.01042	10.66466	30
31	9.33591	9.98955	9.34635	10.65365	10.01045	10.66409	29
32	9.33647	9.98953	9.34695	10.65305	10.01047	10.66352	28
33	9.33704	9.98950	9.34755	10.65245	10.01050	10.66296	27
34	9.33761	9.98947	9.34814	10.65186	10.01053	10.66239	26
35	9.33818	9.98944	9.34873	10.65126	10.01056	10.66182	25
36	9.33874	9.98941	9.34933	10.65067	10.01059	10.66126	24
37	9.33931	9.98938	9.34992	10.65008	10.01062	10.66069	23
38	9.33987	9.98936	9.35051	10.64949	10.01064	10.66013	22
39	9.34043	9.98933	9.35111	10.64889	10.01067	10.65957	21
40	9.34100	9.98930	9.35170	10.64830	10.01070	10.65900	20
41	9.34156	9.98927	9.35229	10.64771	10.01073	10.65844	19
42	9.34212	9.98924	9.35288	10.64712	10.01076	10.65788	18
43	9.34268	9.98921	9.35346	10.64653	10.01079	10.65732	17
44	9.34324	9.98919	9.35405	10.64595	10.01081	10.65676	16
45	9.34380	9.98916	9.35464	10.64536	10.01084	10.65620	15
46	9.34435	9.98913	9.35523	10.64478	10.01087	10.65564	14
47	9.34491	9.98910	9.35581	10.64419	10.01090	10.65509	13
48	9.34547	9.98907	9.35640	10.64360	10.01093	10.65453	12
49	9.34602	9.98904	9.35698	10.64302	10.01096	10.65398	11
50	9.34658	9.98901	9.35757	10.64243	10.01099	10.65342	10
51	9.34713	9.98898	9.35815	10.64185	10.01101	10.65287	9
52	9.34769	9.98896	9.35873	10.64127	10.01104	10.65231	8
53	9.34824	9.98893	9.35931	10.64069	10.01107	10.65176	7
54	9.34879	9.98890	9.35989	10.64011	10.01110	10.65121	6
55	9.34934	9.98887	9.36047	10.63953	10.01113	10.65066	5
56	9.34989	9.98884	9.46105	10.63895	10.01116	10.65011	4
57	9.35044	9.98881	9.36163	10.63837	10.01119	10.64956	3
58	9.35099	9.98878	9.36221	10.63779	10.01122	10.64901	2
59	9.35154	9.98875	9.36279	10.63721	10.01125	10.64846	1
60	9.35209	9.98872	9.36336	10.63664	10.01128	10.64791	0
	Co-ſine.	Sine.	Co tang.	Tangent.	Co-ſecant	Secant.	M.

77 Degrees.

A Table of Artificial Sines, Tang. and Sec. 13 Degrees.

M	Sine.	Co-ſine.	Tangent.	Co-tang.	Secant.	Co-ſecant	
0	9.35209	9.98872	9.36336	10.63664	10.01128	10.64791	60
1	9.35262	9.98869	9.36394	10.63606	10.01130	10.64736	59
2	9.35318	9.98867	9.36451	10.63548	10.01133	10.64682	58
3	9.35373	9.98864	9.36509	10.63491	10.01136	10.64627	57
4	9.35427	9.98861	9.36566	10.63434	10.01139	10.64573	36
5	9.35481	9.98858	9.36624	10.63376	10.01142	10.64518	55
6	9.35536	9.98855	9.36681	10.63319	10.01145	10.64464	54
7	9.35590	9.98852	9.36738	10.63262	10.01148	10.64410	53
8	9.35644	9.98849	9.36795	10.63205	10.01151	10.64356	52
9	9.35698	9.98846	9.36852	10.63148	10.01154	10.64302	51
10	9.35752	9.98843	9.36909	10.63091	10.01157	10.64248	50
11	9.35806	9.98840	9.36966	10.63034	10.01160	10.64194	49
12	9.35860	9.98837	9.37023	10.62977	10.01163	10.64140	48
13	9.35914	9.98834	9.37080	10.62920	10.01166	10.64086	47
14	9.35968	9.98831	9.37137	10.62863	10.01169	10.64032	46
15	9.36021	9.98828	9.37193	10.62807	10.01172	10.63978	45
16	9.36075	9.98825	9.37250	10.62750	10.01175	10.63925	44
17	9.36129	9.98821	9.37306	10.62694	10.01178	10.63871	43
18	9.36182	9.98819	9.37363	10.62637	10.01181	10.63818	42
19	9.36236	9.98816	9.37419	10.62581	10.01184	10.63764	41
20	9.36289	9.98813	9.37476	10.62524	10.01187	10.63711	40
21	9.36342	9.98810	9.37532	10.62468	10.01190	10.63658	39
22	9.36395	9.98807	9.37588	10.62412	10.01193	10.63605	38
23	9.36448	9.98804	9.37644	10.62356	10.01196	10.63551	37
24	9.36502	9.98801	9.37700	10.62300	10.01199	10.63498	36
25	9.36555	9.98798	9.37756	10.62244	10.01202	10.63445	35
26	9.36607	9.98795	9.37812	10.62188	10.01205	10.63392	34
27	9.36660	9.98792	9.37869	10.62132	10.01208	10.63340	33
28	9.36713	9.98789	9.37924	10.62076	10.01211	10.93287	32
29	9.36766	9.98786	9.37980	10.62020	10.01214	10.63234	31
30	9.36818	9.98783	9.38035	10.61965	10.01217	10.63181	30
31	9.36871	9.98780	9.38091	10.61909	10.01220	10.63129	29
32	9.36924	9.98777	9.38147	10.61853	10.01223	10.63076	28
33	9.36976	9.98774	9.38202	10.61798	10.01226	10.63024	27
34	9.37028	9.98771	9.38257	10.61742	10.01229	10.62971	26
35	9.37081	9.98768	9.38313	10.61687	10.01232	10.62919	25
36	9.37133	9.98765	9.38368	10.61632	10.01235	10.62867	24
37	9.37185	9.98762	9.38423	10.61577	10.01238	10.62815	23
38	9.37237	9.98759	9.38479	10.61521	10.01241	10.62763	22
39	9.37289	9.98756	9.38534	10.61466	10.01244	10.62711	21
40	9.37341	9.98753	9.38589	10.61411	10.01247	10.62659	20
41	9.37393	9.98749	9.38644	10.61356	10.01250	10.62607	19
42	9.37445	9.98746	9.38699	10.61301	10.01254	10.62555	18
43	9.37497	9.98743	9.38754	10.61246	10.01257	10.62503	17
44	9.37549	9.98740	9.38808	10.61192	10.01260	10.62451	16
45	9.37600	9.98737	9.38863	10.61137	10.01263	10.62400	15
46	9.37652	9.98734	9.38918	10.61082	10.01266	10.62348	14
47	9.37703	9.98731	9.38972	10.61028	10.01269	10.62296	13
48	9.37755	9.98728	9.39027	10.60973	10.01272	10.62245	12
49	9.37806	9.98725	9.39081	10.60918	10.01275	10.62194	11
50	9.37858	9.98722	9.39136	10.60864	10.01278	10.62142	10
51	9.37909	9.98719	9.39190	10.60810	10.01281	10.62091	9
52	9.37960	9.98715	9.39245	10.60755	10.01285	10.62040	8
53	5.38011	9.98712	9.39299	10.60701	10.01288	10.61989	7
54	9.38062	9.98709	9.39353	10.60647	10.01291	10.61938	6
55	9.38113	9.98706	9.39407	10.60593	10.01294	10.61887	5
56	9.38164	9.98703	9.39461	10.60539	10.01297	10.61836	4
57	9.38215	9.98700	9.39515	10.60485	10.01300	10.61785	3
58	9.38266	9.98697	9.39569	10.60431	10.01303	10.61734	2
59	9.38317	9.98694	9.39623	10.60377	10.01306	10.61683	1
60	9.38368	9.98690	9.39677	10.60323	10.01310	10.61632	0
	Co Sine.	Sine.	Co-tang.	Tangent.	Co-ſecant	Secant.	M.

76 Degrees.

A Table of Artificial Sines, Tang. and Sec. 14 Degrees.

M.	Sine.	Co-ſine.	Tangent.	Co-tang.	Secant.	Co-ſecant	
0	9.38368	9.98690	9.39677	10.60323	10.01310	10.61632	60
1	9.38418	9.98687	9.39731	10.60269	10.01313	10.61582	59
2	9.38469	9.98684	9.39785	10.60215	10.01316	10.61531	58
3	9.38519	9.98681	9.39838	10.60162	10.01319	10.61481	57
4	9.38570	9.98678	9.39892	10.60108	10.01322	10.61430	56
5	9.38620	9.98675	9.39945	10.60054	10.01325	10.61380	55
6	9.38670	9.98671	9.39999	10.60001	10.01329	10.61330	54
7	9.38721	9.98668	9.40052	10.59948	10.01332	10.61280	53
8	9.38771	9.98665	9.40106	10.59894	10.01335	10.61229	52
9	9.38821	9.98662	9.40159	10.59841	10.01338	10.61179	51
10	9.38871	9.98659	9.40212	10.59788	10.01341	10.61129	50
11	9.38921	9.98655	9.40266	10.59734	10.01344	10.61079	49
12	9.38971	9.98652	9.40319	10.59681	10.01348	10.61029	48
13	9.39021	9.98649	9.40372	10.59628	10.01351	10.60979	47
14	9.39071	9.98646	9.40425	10.59575	10.01354	10.60929	46
15	9.39121	9.98643	9.40478	10.59522	10.01357	10.60879	45
16	9.39170	9.98640	9.40531	10.59469	10.01360	10.60830	44
17	9.39220	9.98636	9.40584	10.59416	10.01364	10.60780	43
18	9.39270	9.98633	9.40636	10.59363	10.01367	10.60730	42
19	9.39319	9.98630	9.40689	10.59311	10.01371	10.60681	41
20	9.39369	9.98627	9.40742	10.59258	10.01373	10.60631	40
21	9.39418	9.98623	9.40795	10.59205	10.01377	10.60582	39
22	9.39467	9.98620	9.40847	10.59153	10.01380	10.60533	38
23	9.39517	9.98617	9.40900	10.59100	10.01383	10.60483	37
24	9.39566	9.98614	9.40952	10.59048	10.01386	10.60434	36
25	9.39615	9.98610	9.41004	10.58995	10.01390	10.60385	35
26	9.39664	9.98607	9.41057	10.58943	10.01393	10.60336	34
27	9.39713	9.98604	9.41109	10.58891	10.01396	10.60287	33
28	9.39762	9.98601	9.41161	10.58839	10.01399	10.60238	32
29	9.39811	9.98597	9.41214	10.58786	10.01403	10.60189	31
30	9.39860	9.98594	9.41266	10.58734	10.01406	10.60140	30
31	9.39909	9.98591	9.41318	10.58682	10.01409	10.60091	29
32	9.39957	9.98588	9.41370	10.58630	10.01412	10.60042	28
33	9.40006	9.98584	9.41422	10.58578	10.01416	10.59994	27
34	9.40055	9.98581	9.41474	10.58526	10.01419	10.59945	26
35	9.40103	9.98578	9.41526	10.58474	10.01422	10.59896	25
36	9.40152	9.98574	9.41577	10.58422	10.01425	10.59848	24
37	9.40200	9.98571	9.41629	10.58371	10.01429	10.59800	23
38	9.40249	9.98568	9.41681	10.58319	10.01432	10.59751	22
39	9.40297	9.98565	9.41733	10.58267	10.01435	10.59703	21
40	9.40345	9.98561	9.41784	10.58216	10.01439	10.59654	20
41	9.40394	9.98558	9.41836	10.58164	10.01442	10.59606	19
42	9.40442	9.98555	9.41887	10.58113	10.01445	10.59558	18
43	9.40490	9.98551	9.41939	10.58061	10.01449	10.59510	17
44	9.40538	9.98548	9.41990	10.58010	10.01452	10.59462	16
45	9.40586	9.98545	9.42041	10.57958	10.01455	10.59414	15
46	9.40634	9.98541	9.42 93	10.57907	10.01459	10.59366	14
47	9.40682	9.98538	9.42144	10.57856	10.01462	10.59318	13
48	9.40730	9.98535	9.42195	10.57805	10.01465	10.59270	12
49	9.40778	9.98531	9.42246	10.57754	10.01469	10.59222	11
50	9.40825	9.98528	9.42297	10.47703	10.01472	10.59175	10
51	9.40873	9.98525	9.42348	10.57652	10.01475	10.59127	9
52	9.40921	9.98421	9.42399	10.57601	10.01479	10.59079	8
53	9.40968	9.98518	9.42450	10.57550	10.01482	10.59032	7
54	9.41016	9.98515	9.42501	10.57499	10.01485	10.58984	6
55	9.41063	9.98511	9.42552	10.57448	10.01489	10.58937	5
56	9.41111	9.98508	9.42603	10.57397	10.01492	10.58889	4
57	9.41158	9.98504	9.42653	10.57347	10.01495	10.58842	3
58	9.41205	9.98501	9.42704	10.57296	10.01499	10.58795	2
59	9.41252	9.98498	9.42755	10.57245	10.01502	10.58748	1
60	9.41300	9.98494	9.42805	10.57195	10.01505	10.58700	0
M.	Co-ſine.	Sine.	Co-tang.	Tangent.	Co-ſecant	Secant.	M.

75 Degrees.

A Table of Artificial Sines, Tang. and Sec. 15 Degrees.

M	Sine.	Co-ſine.	Tangent.	Co-tang.	Secant.	Co-ſecant	
0	9.41500	9.98494	9.42805	10.57195	10.01506	10.58700	60
1	9.41347	9.98491	9.42856	10.57144	10.01509	10.58653	59
2	9.41394	9.98488	9.42906	10.57094	10.01512	10.58606	58
3	9.41441	9.98484	9.42957	10.57043	10.01516	10.58559	57
4	9.41488	9.98481	9.43007	10.56993	10.01519	10.58512	56
5	9.41535	9.98477	9.43057	10.56943	10.01523	10.58465	55
6	9.41582	9.98474	9.43108	10.56892	10.01526	10.58418	54
7	9.41628	9.98471	9.43158	10.56842	10.01529	10.58372	53
8	9.41 75	9.98467	9.43208	10.56792	10.01533	10.58325	52
9	9.41722	9.98464	9.43258	10.56742	10.01536	10.58278	51
10	9.41768	9.98460	9.43308	10.56692	10.01540	10.58232	50
11	9.41815	9.98457	9.43358	10.56642	10.01543	10.58185	49
12	9.41861	9.98453	9.43408	10.56592	10.01547	10.58138	48
13	9.41908	9.98450	9.43458	10.56542	10.01550	10.58092	47
14	9.41954	9.98447	9.43508	10.56492	10.01553	10.58046	46
15	9.42001	9.98443	9.43558	10.56442	10.01557	10.57999	45
16	9.42047	9.98440	9.43607	10.56393	10.01560	10.57953	44
17	9.42093	9.98436	9.43657	10.56343	10.01564	10.57907	43
18	9.42139	9.98433	9.43707	10.56293	10.01567	10.57860	42
19	9.42186	9.98429	9.43756	10.56244	10.01571	10.57814	41
20	9.42232	9.98426	9.43806	10.56194	10.01574	10.57768	40
21	9.42278	9.98422	9.43855	10.56145	10.01578	10.57722	39
22	9.42324	9.98419	9.43905	10.56095	10.01581	10.57676	38
23	9.42370	9.98415	9.43954	10.56046	10.01584	10.57630	37
24	9.42416	9.98412	9.44004	10.55996	10.01588	10.57584	36
25	9.42461	9.98409	9.44053	10.55947	10.01591	10.57538	35
26	9.42507	9.98405	9.44102	10.55898	10.01595	10.57493	34
27	9.42553	9.98402	9.44151	10.55848	10.01598	10.57447	33
28	9.42599	9.98398	9.44201	10.55799	10.01602	10.57401	32
29	9.42644	9.98395	9.44250	10.55750	10.01605	10.57356	31
30	9.42690	9.98391	9.44299	10.55701	10.01609	10.57310	30
31	9.42735	9.98388	9.44348	10.55652	10.01612	10.57265	29
32	9.42781	9.98384	9.44397	10.55603	10.01616	10.57219	28
33	9.42826	9.98381	9.44446	10.55554	10.01619	10.57174	27
34	9.42872	9.98377	9.44495	10.55505	10.01623	10.57128	26
35	9.42917	9.98373	9.44544	10.55455	10.01626	10.57083	25
36	9.42962	9.98370	9.44592	10.55408	10.01630	10.57038	24
37	9.43007	9.98366	9.44641	10.55359	10.01634	10.56993	23
38	9.43053	9.98363	9.44690	10.55310	10.01637	10.56947	22
39	9.43098	9.98359	9.44738	10.55262	10.01641	10.56902	21
40	9.43143	9.98356	9.44787	10.55213	10.01644	10.56857	20
41	9.43188	9.98352	9.44836	10.55164	10.01648	10.56812	19
42	9.43233	9.98349	9.44884	10.55116	10.01651	10.56767	18
43	9.43278	9.98345	9.44933	10.55067	10.01655	10.56722	17
44	9.43323	9.98342	9.44981	10.55019	10.01658	10.56677	16
45	9.43367	9.98338	9.45029	10.54971	10.01662	10.56632	15
46	9.43412	9.98334	9.45078	10.54922	10.01666	10.56588	14
47	9.43457	9.98331	9.45126	10.54874	10.01669	10.56543	13
48	9.43502	9.98327	9.45174	10.54826	10.01673	10.56498	12
49	9.43546	9.98324	9.45222	10.54778	10.01676	10.56454	11
50	9.43590	9.98320	9.45271	10.54729	10.01680	10.56409	10
51	9.43635	9.98317	9.45319	10.54681	10.01683	10.56365	9
52	9.43680	9.98313	9.45367	10.54633	10.01687	10.56320	8
53	9.43724	9.98309	9.45415	10.54585	10.01691	10.56276	7
54	9.43769	9.98306	9.45463	10.54537	10.01694	10.56231	6
55	9.43813	9.98302	9.45511	10.54489	10.01698	10.56187	5
56	9.43857	9.98299	9.45559	10.54441	10.01701	10.56143	4
57	9.43901	9.98295	9.45606	10.54395	10.01705	10.56099	3
58	9.43946	9.98291	9.45654	10.54346	10.01709	10.56064	2
59	9.43990	9.98288	9.45702	10.54298	10.01712	10.56010	1
60	9.44034	9.98284	9.45750	10.54250	10.01716	10.55966	0
	Co ſine.	Sine.	Co-tang.	Tangent.	Co-ſecant	Secant.	M.

74 Degrees.

A Table of Artificial Sines, Tang. and Sec. 16 Degrees.

M.	Sine.	Co-ſine	Tangent.	Co-tang	Secant	Co-ſecant	
0	9.44034	9.98284	9.45750	10.54250	10.01716	10.55966	60
1	9.44078	9.98281	9.45797	10.54203	10.01719	10.55922	59
2	9.44122	9.98277	9.45845	10.54155	10.01723	10.55878	58
3	9.44166	9.98273	9.45892	10.54108	10.01727	10.55834	57
4	9.44210	9.98270	9.45940	10.54060	10.01730	10.55790	56
5	9.44253	9.98266	9.45987	10.54013	10.01734	10.55746	55
6	9.44297	9.98262	9.46035	10.53965	10.01738	10.55703	54
7	9.44341	9.98259	9.46082	10.53918	10.01741	10.55659	53
8	9.44385	9.98255	9.46130	10.53870	10.01745	10.55615	52
9	9.44428	9.98251	9.46177	10.53823	10.01749	10.55572	51
10	9.44472	9.98248	9.46224	10.53776	10.01752	10.55528	50
11	9.44515	9.98244	9.46271	10.53728	10.01756	10.55484	49
12	9.44559	9.98240	9.46319	10.53681	10.01760	10.55441	48
13	9.44602	9.98237	9.46366	10.53634	10.01763	10.53397	47
14	9.44646	9.98233	9.46413	10.53587	10.01767	10.55354	46
15	9.44689	9.98229	9.46460	10.53540	10.01771	10.55311	45
16	9.44733	9.98226	9.46507	10.53493	10.01774	10.55267	44
17	9.44776	9.98222	9.46554	10.53446	10.01778	10.55224	43
18	9.44819	9.98218	9.46601	10.53399	10.01782	10.55181	42
19	9.44862	9.98215	9.46648	10.53352	10.01785	10.55138	41
20	9.44905	9.98211	9.46694	10.53306	10.01789	10.55095	40
21	9.44948	9.98207	9.46741	10.53259	10.01793	10.55051	39
22	9.44991	9.98203	9.46788	10.53212	10.01796	10.55008	38
23	9.45035	9.98200	9.46835	10.53165	10.01800	10.54965	37
24	9.45077	9.98196	9.46881	10.53119	10.01804	10.54923	36
25	9.45120	9.98192	9.46928	10.53072	10.01808	10.54880	35
26	9.45163	9.98189	9.46975	10.53025	10.01811	10.54837	34
27	9.45206	9.98185	9.47021	10.52979	10.01815	10.54794	33
28	9.45249	9.98181	9.47068	10.52932	10.01819	10.54751	32
29	9.45292	9.98177	9.47114	10.52886	10.01823	10.54708	31
30	9.45334	9.98174	9.47160	10.52840	10.01826	10.54666	30
31	9.45377	9.98170	9.47207	10.52793	10.01830	10.54624	29
32	9.45419	9.98166	9.47253	10.52747	10.01834	10.54581	28
33	9.45462	9.98162	9.47299	10.52701	10.01838	10.54538	27
34	9.45504	9.98159	9.47346	10.52654	10.01841	10.54496	26
35	9.45547	9.98155	9.47392	10.52608	10.01845	10.54453	25
36	9.45589	9.98151	9.47438	10.52562	10.01849	10.54411	24
37	9.45632	9.98147	9.47484	10.52516	10.01853	10.54368	23
38	9.45674	9.98144	9.47530	10.52470	10.01856	10.54326	22
39	9.45716	9.98140	9.47576	10.52424	10.01860	10.54284	21
40	9.45758	9.98136	9.47622	10.52378	10.01864	10.54242	20
41	9.45801	9.98132	9.47668	10.52332	10.01868	10.54199	19
42	9.45843	9.98128	9.47714	10.52286	10.01871	10.54157	18
43	9.45885	9.98125	9.47760	10.52240	10.01875	10.54115	17
44	9.45927	9.98121	9.47806	10.52194	10.01879	10.54073	16
45	9.45969	9.98117	9.47852	10.52148	10.01883	10.54031	15
46	9.46011	9.98113	9.47897	10.52102	10.01887	10.53989	14
47	9.46053	9.98109	9.47943	10.52057	10.01890	10.53947	13
48	9.46095	9.98106	9.47986	10.52011	10.01894	10.53905	12
49	9.46136	9.98102	9.48034	10.51965	10.01898	10.53864	11
50	9.46178	9.98098	9.48080	10.51920	10.01902	10.53822	10
51	9.46220	9.98094	9.48126	10.51874	10.01906	10.53780	9
52	9.46262	9.98090	9.48171	10.51829	10.01910	10.53738	8
53	9.46303	9.98087	9.48217	10.51783	10.01913	10.53697	7
54	9.46345	9.98083	9.48262	10.51738	10.01917	10.53655	6
55	9.46386	9.98979	9.48307	10.51692	10.01921	10.53614	5
56	9.46428	9.98075	9.48353	10.51647	10.01925	10.53572	4
57	9.46469	9.98071	9.48398	10.51602	10.01929	10.53531	3
58	9.46511	9.98067	9.48443	10.51557	10.01933	10.53589	2
59	9.46552	9.98063	9.48489	10.51511	10.01937	10.53448	1
60	9.46594	9.98060	9.48534	10.51466	10.01940	10.53406	0
	Co-ſine.	Sine.	Co-tang.	Tangent.	Co-ſecant	Secant.	M.

73 Degrees.

A Table of Artificial Sines, Tang. and Sec. 17 Degrees.

M.	Sine.	Co-ſine.	Tangent.	Co-tang.	Secant.	Co-ſecant	
0	9.46593	9.98060	9.48534	10.51466	10.01940	10.53406	60
1	9.46635	9.98056	9.48579	10.51421	10.01944	10.53365	59
2	9.46676	9.98052	9.48624	10.51376	10.01948	10.53324	58
3	9.46717	9.98048	9.48669	10.51331	10.01952	10.53283	57
4	9.46758	9.98044	9.48714	10.51286	10.01956	10.53241	56
5	9.46800	9.98040	9.48759	10.51241	10.01960	10.53200	55
6	9.46841	9.98036	9.48804	10.51196	10.01964	10.53159	54
7	9.46882	9.98032	9.48849	10.51151	10.01968	10.53118	53
8	9.46923	9.98029	9.48894	10.51106	10.01971	10.53077	52
9	9.46964	9.98025	9.48939	10.51061	10.01975	10.53036	51
10	9.47005	9.98021	9.48984	10.51016	10.01979	10.52995	50
11	9.47045	9.98017	9.49029	10.50971	10.01983	10.52954	49
12	9.47086	9.98013	9.49073	10.50927	10.01987	10.52914	48
13	9.47127	9.98009	9.49118	10.50882	10.01991	10.52873	47
14	9.47168	9.98005	9.49163	10.50837	10.01995	10.52832	46
15	9.47209	9.98001	9.49207	10.50793	10.01999	10.52791	45
16	9.47249	9.97997	9.49252	10.50748	10.02003	10.52751	44
17	9.47290	9.97993	9.49296	10.50703	10.02007	10.52710	43
18	9.47330	9.97989	9.49341	10.50659	10.02010	10.52670	42
19	9.47371	9.97986	9.49385	10.50614	10.02014	10.52629	41
20	9.47411	9.97982	9.49430	10.50570	10.02018	10.52588	40
21	9.47452	9.97978	9.49474	10.50526	10.02022	10.52548	39
22	9.47492	9.97974	9.49519	10.50481	10.02026	10.52508	38
23	9.47533	9.97970	9.49563	10.50437	10.02030	10.52467	37
24	9.47573	9.97966	9.49607	10.50393	10.02034	10.52427	36
25	9.47613	9.97962	9.49651	10.50348	10.02038	10.52387	35
26	9.47654	9.97958	9.49696	10.50304	10.02042	10.52346	34
27	9.47694	9.97954	9.49740	10.50260	10.02046	10.52306	33
28	9.47734	9.97950	9.49784	10.50216	10.02050	10.52266	32
29	9.47774	9.97946	9.49828	10.50172	10.02054	10.52226	31
30	9.47814	9.97942	9.49872	10.50128	10.02058	10.52186	30
31	9.47854	9.97938	9.49916	10.50084	10.02062	10.52146	29
32	9.47894	9.97934	9.49960	10.50040	10.02066	10.52106	28
33	9.47934	9.97930	9.50004	10.49996	10.02070	10.52066	27
34	9.47974	9.97926	9.50048	10.49952	10.02074	10.52026	26
35	9.48014	9.97922	9.50092	10.49908	10.02078	10.51986	25
36	9.48054	9.97918	9.50136	10.49864	10.02082	10.51946	24
37	9.48094	9.97914	9.50180	10.49820	10.02086	10.51906	23
38	9.48133	9.97910	9.50223	10.49776	10.02090	10.51867	22
39	9.48173	9.97906	9.50267	10.49733	10.02094	10.51827	21
40	9.48213	9.97902	9.50311	10.49689	10.02098	10.51787	20
41	9.48252	9.97898	9.50355	10.49645	10.02102	10.51747	19
42	9.48292	9.97894	9.50398	10.49602	10.02106	10.51708	18
43	9.48332	9.97890	9.50442	10.49558	10.02110	10.51668	17
44	9.48371	9.97886	9.50485	10.49515	10.02114	10.51629	16
45	9.48411	9.97882	9.50529	10.49471	10.02118	10.51589	15
46	9.48450	9.97878	9.50572	10.49428	10.02122	10.51550	14
47	9.48489	9.97874	9.50616	10.49384	10.02126	10.51510	13
48	9.48529	9.97870	9.50659	10.49341	10.02130	10.51471	12
49	9.48568	9.97866	9.50703	10.49297	10.02134	10.51432	11
50	9.48607	9.97861	9.50746	10.49254	10.02139	10.51392	10
51	9.48647	9.97857	9.50789	10.49211	10.02143	10.51353	9
52	9.48686	9.97853	9.50833	10.49167	10.02147	10.51314	8
53	9.48725	9.97849	9.50876	10.49124	10.02151	10.51275	7
54	9.48764	9.97845	9.50919	10.49081	10.02155	10.51236	6
55	9.48803	9.97841	9.50962	10.49038	10.02159	10.51197	5
56	9.48842	9.97837	9.51005	10.48995	10.02163	10.51158	4
57	9.48881	9.97833	9.51048	10.48951	10.02167	10.51119	3
58	9.48920	9.97829	9.51092	10.48908	10.02171	10.51080	2
59	9.48959	9.97825	9.51135	10.48865	10.02175	10.51041	1
60	9.48998	9.97821	9.51178	10.48822	10.02179	10.51002	0
	Co-ſine	Sine	Co-tang.	Tangent.	Co-ſecant	Secant.	M.

72 Degrees.

A Table of Artificial Sines, Tang. and Sec. 18 Degrees.

M.	Sine.	Co-ſine.	Tangent.	Co-tang.	Secant.	Co-ſecant	
0	9.48998	9.97821	9.51178	10.48822	10.02179	10.51002	60
1	9.49037	9.97817	9.51221	10.48779	10.02183	10.50963	59
2	9.49076	9.97812	9.51263	10.48736	10.02188	10.50924	58
3	9.49115	9.97808	9.51306	10.48694	10.02192	10.50885	57
4	9.49153	9.97804	9.51349	10.48651	10.02196	10.50847	56
5	9.49192	9.97800	9.51392	10.48608	10.02200	10.50808	55
6	9.49231	9.97796	9.51435	10.48565	10.02204	10.50769	54
7	9.49269	9.97792	9.51478	10.48522	10.02208	10.50730	53
8	9.49308	9.97788	9.51520	10.48480	10.02212	10.50692	52
9	9.49347	9.97784	9.51563	10.48437	10.02216	10.50653	51
10	9.49385	9.97779	9.51606	10.48394	10.02221	10.50615	50
11	9.49424	9.97775	9.51648	10.48352	10.02225	10.50576	49
12	9.49462	9.97771	9.51691	10.48309	10.02229	10.50538	48
13	9.49500	9.97767	9.51734	10.48266	10.02233	10.50500	47
14	9.49539	9.97763	9.51776	10.48224	10.02237	10.50461	46
15	9.49577	9.97759	9.51818	10.48181	10.02241	10.50423	45
16	9.49615	9.97754	9.51861	10.48139	10.02246	10.50385	44
17	9.49654	9.97750	9.51903	10.48097	10.02250	10.50346	43
18	9.49692	9.97746	9.51946	10.48054	10.02254	10.50308	42
19	9.49730	9.97742	9.51988	10.48012	10.02258	10.50270	41
20	9.49768	9.97738	9.52031	10.47969	10.02262	10.50232	40
21	9.49806	9.97733	9.52073	10.47927	10.02266	10.50194	39
22	9.49840	9.97729	9.52115	10.47885	10.02271	10.50156	38
23	9.49882	9.97725	9.52157	10.47843	10.02275	10.50118	37
24	9.49924	9.97721	9.52199	10.47800	10.02279	10.50083	36
25	9.49958	9.97717	9.52242	10.47758	10.02283	10.50042	35
26	9.49996	9.97813	9.52283	10.47716	10.02287	10.50004	34
27	9.50034	9.97708	9.52326	10.47674	10.02292	10.49966	33
28	9.50072	9.97704	9.52368	10.47632	10.02296	10.49928	32
29	9.50110	9.97700	9.52410	10.47590	10.02300	10.49890	31
30	9.50145	9.97696	9.52452	10.47548	10.02304	10.49852	30
31	9.50185	9.97691	9.52494	10.47506	10.02309	10.49815	29
32	9.50223	9.97687	9.52536	10.47464	10.02313	10.49777	28
33	9.50261	9.97683	9.52578	10.47422	10.02317	10.49739	27
34	9.50298	9.97679	9.52620	10.47380	10.02321	10.49702	26
35	9.50336	9.97674	9.52661	10.47338	10.02326	10.49664	25
36	9.50373	9.97670	9.52703	10.47297	10.02330	10.49626	24
37	9.50411	9.97666	9.52745	10.47255	10.02334	10.49589	23
38	9.50448	9.97662	9.52787	10.47213	10.02338	10.49551	22
39	9.50486	9.97657	9.52828	10.47171	10.02343	10.49514	21
40	9.50523	9.97653	9.52870	10.47130	10.02347	10.49477	20
41	9.50561	9.97649	9.52912	10.47088	10.02351	10.49439	19
42	9.50598	9.97645	9.52953	10.47047	10.02355	10.49402	18
43	9.50635	9.97640	9.52995	10.47005	10.02360	10.49365	17
44	9.50673	9.97636	9.53037	10.46963	10.02364	10.49327	16
45	9.50710	9.97632	9.53078	10.46922	10.02368	10.49290	15
46	9.50747	9.97627	9.53120	10.46880	10.02372	10.49253	14
47	9.50784	9.97623	9.53161	10.46839	10.02377	10.49216	13
48	9.50821	9.97619	9.53202	10.46797	10.02381	10.49179	12
49	9.50858	9.97615	9.53244	10.46756	10.02385	10.49141	11
50	9.50896	9.97610	9.53285	10.46715	10.02390	10.49104	10
51	9.50933	9.97606	9.53327	10.46673	10.02394	10.49067	9
52	9.50970	9.97602	9.53368	10.46632	10.02398	10.49030	8
53	9.51006	9.97597	9.53409	10.46591	10.02403	10.48993	7
54	9.51043	9.97593	9.53450	10.46550	10.02407	10.48957	6
55	9.51080	9.97589	9.53492	10.46508	10.02411	10.48920	5
56	9.51117	9.97584	9.53533	10.46467	10.02416	10.48883	7
57	9.51154	9.97580	9.53574	10.46426	10.02420	10.48846	3
58	9.51191	9.97576	9.53615	10.46385	10.02424	10.48809	2
59	9.51227	9.97571	9.53656	10.46344	10.02429	10.48772	1
60	9.51264	9.97567	9.53698	10.46302	10.02433	10.48736	0
	Co-ſine.	Sine.	Co-tang.	Tangent.	Co-ſecant.	Secant.	M.

71 Degrees.

A Table of Artificial Sines, Tang. and Sec. 19 Degrees.

M.	Sine.	Co-ſine.	Tangent.	Co-tang.	Secant.	Co-ſecant	
0	9.51264	9.97567	9.53697	10.46303	10.02433	10.48736	60
1	9.51301	9.97563	9.53738	10.46262	10.02437	10.48699	59
2	9.51337	9.97558	9.53779	10.46221	10.02442	10.48662	58
3	9.51374	9.97554	9.53820	10.46180	10,02446	10.48626	57
4	9.51411	9.97550	9.53861	10.46139	10.02450	10.48589	56
5	9.51447	9.97545	9.53902	10.46098	10.02455	10.48553	55
6	9.51484	9.97541	9.53943	10.46057	10.02459	10.48516	54
7	9.51520	9.97536	9.53984	10.46016	10.02463	10.48480	53
8	9.51557	9.97532	9.54024	10.45975	10.02468	10.48443	52
9	9.51593	9.97528	9.54065	10.45935	10.02472	10.48487	51
10	9.51629	9.97523	9.54106	10.45894	10.02477	10.48371	50
11	9.51666	9.97519	9.54147	10.45853	10.02481	10.48334	49
12	9.51702	9.97514	9.54187	10.45812	10.02485	10.48298	48
13	9.51738	9.97510	9.54228	10.45772	10.02490	10.48262	47
14	9.51774	9.97506	9.54269	10.45731	10.02494	10.48226	46
15	9.51811	9.97501	9.54309	10.45691	10.02499	10.48189	45
16	9.51847	9.97497	9.54350	10.45650	10.02503	10.48153	44
17	9.51883	9.97492	9.54390	10.45610	10.02508	10.48117	43
18	9.51919	9.97488	9.54431	10.45569	10.02512	10.48081	42
19	9.51955	9.97484	9.54471	10.45529	10.02516	10.48045	41
20	9.52991	9.97479	9.54512	10.45488	10.02521	10.47009	40
21	9.52027	9.97475	9.54552	10.45448	10.02525	10.47973	30
22	9.52063	9.97470	9.54593	10.45407	10.02530	10.47937	38
23	9.52099	9.97466	9.54633	10.45367	10.02534	10.47901	37
24	9.52135	9.97461	9.54673	10.45326	10.02539	10,47865	36
25	9.52171	9.97457	9.54714	10.45286	10.02543	10.47829	35
26	9.52207	9.97452	9.54754	10.45246	10.02547	10.47793	34
27	9.52242	9.97448	9.54794	10.45206	10.02552	10.47758	33
28	9.52278	9.97444	9.54835	10.45165	10.02556	10.47722	32
29	9.52314	9.97439	9.54875	10.45125	10.02561	10.47686	31
30	9.52350	9.97435	9.54915	10.45085	10.02565	10.47650	30
31	9.52385	9.97430	9.54955	10.45045	10.02570	10.47615	29
32	9.52421	9.97426	9.54995	10.45005	10.02574	10.47579	28
33	9.52456	9.97421	9.55035	10.44965	10.02579	10.47544	27
34	9.52492	9.97417	9.55075	10.44925	10.02583	10.47508	26
35	9.52527	9.97412	9.55115	10.44885	10.02588	10.47472	25
36	9.52563	9.97408	9.55155	10.44845	10.02592	10.47437	24
37	9.52598	9.97403	9.55195	10.44805	10.02597	10.47402	23
38	9.52634	9.97399	9.55235	10.44765	10.02601	10.47366	22
39	9,52669	9.97394	9.55275	10.44725	10.02606	10.47331	21
40	9.52705	9.97390	9.55315	10.44685	10.02610	10.47295	20
41	9.52740	9.97385	9.55355	10.44645	10.02615	10.47260	19
42	9.52775	9.97381	9.55395	10.44605	10.02619	10.47225	18
43	9.52810	9.97376	9.55434	10.44566	10.02624	10.47189	17
44	9.52846	9.97372	9.55474	10.44526	10.02628	10.47154	16
45	9.52881	9.97367	9.55514	10.44486	10.02633	10.47119	15
46	9.52916	9.97362	9.55554	10.44446	10.02637	10.47084	14
47	9.52951	9.97358	9.55593	10.44407	10.02642	10.47049	13
48	9.52986	9.97353	9.55633	10.44367	10.02647	10.47014	12
49	9.53021	9.97349	9.55673	10.44327	10.02651	10.46979	11
50	9.53056	9.97344	9.55712	10.44288	10.02656	10.46943	10
51	9.53091	9.97340	9.55752	10.44243	10.02660	10.46908	9
52	9.53126	9.97335	9.55791	10.44209	10.02665	10.46873	8
53	9.53161	9.97331	9.55831	10.44169	10.02669	10.46839	7
54	9.53196	9.97326	9.55870	10.44120	10.02674	10.46804	6
55	9.53231	9.97322	9.55910	10.44090	10.02678	10.46769	5
56	9.53266	9.97317	9.55949	10.44051	10.02683	10.46734	4
57	9.53301	9.97312	9.55988	10.44011	10.02688	10.46699	3
58	9.53336	9.97308	9.56028	10.43972	10.02692	10.46664	2
59	9.53370	9.97303	9.56067	10.43933	10.02697	10.46630	1
60	9.53405	9.97299	9.56107	10.43893	10.02701	10.46595	0
	Co-ſine.	Sine.	Co-tang.	Tangent.	Co-ſecant	Secant.	M.

70 Degrees.

A Table of Artificial Sines, Tang. and Sec. 20 Degrees,

M.	Sine.	Co-ſine.	Tangent.	Co-tang.	Secant.	Co-ſecant	
0	9.53405	9.97299	9.56107	10.43893	10.02701	10.46595	60
1	9.53440	9.97294	9.56146	10.43854	10.02706	10.46560	59
2	9.53475	9.97289	9.56185	10.43815	10.02711	10.46525	58
3	9.53509	9.97285	9.56224	10.43776	10.02715	10.46491	57
4	9.53544	9.97280	9.56264	10.43736	10.02720	10.46456	56
5	9.53578	9.97275	9.56303	10.43697	10.02724	10.46422	55
6	9.53613	9.97271	9.56342	10.43658	10.02729	10.46387	54
7	9.53647	9.97266	9.56381	10.43619	10.02734	10.46353	53
8	9.53682	9.97262	9.56420	10.43580	10.02738	10.46318	52
9	9.53716	9.97257	9.56459	10.43541	10.02743	10.46284	51
10	9.53751	9.97252	9.56498	10.43502	10.02748	10.46249	50
11	9.53785	9.97248	9.56537	10.43463	10.02752	10.46215	49
12	9.53819	9.97243	9.56576	10.43424	10.02757	10.46181	48
13	9.53854	9.97238	9.56615	10.43385	10.02762	10.46146	47
14	9.53888	9.97234	9.56654	10.43346	10.02766	10.46112	46
15	9.53922	9.97229	9.56693	10.43307	10.02771	10.46078	45
16	9.53957	9.97225	9.56732	10.43268	10.02776	10.46043	44
17	9.53991	9.97220	9.56771	10.43229	10.02780	10.46009	43
18	9.54025	9.97215	9.56810	10.43190	10.02785	10.45975	42
19	9.54059	9.97210	9.56849	10.43151	10.02789	10.45941	41
20	9.54093	9.97206	9.56887	10.43113	10.02794	10.45908	40
21	9.54127	9.97201	9.56926	10.43074	10.02799	10.45873	39
22	9.54161	9.97196	9.56965	10.43035	10.02804	10.45839	38
23	9.54195	9.97192	9.57003	10.42996	10.02808	10.45805	37
24	9.54229	9.97187	9.57042	10.42958	10.02813	10.45771	36
25	9.54263	9.97182	9.57081	10.42919	10.02818	10.45737	35
26	9.54297	9.97178	9.57120	10.42880	10.02822	10.45703	34
27	9.54331	9.97173	9.57158	10.42842	10.02827	10.45669	33
28	9.54365	9.97168	9.57197	10.42803	10.02832	10.45635	32
29	9.54399	9.97163	9.57235	10.42765	10.02837	10.45601	31
30	9.54432	9.97159	9.57274	10.42726	10.02841	10.45567	30
31	9.54466	9.97154	9.57312	10.42688	10.02846	10.45534	29
32	9.54500	9.97149	9.57351	10.42649	10.02851	10.45500	28
33	9.54534	9.97145	9.57389	10.42611	10.02855	10.45466	27
34	9.54567	9.97140	9.57428	10.42572	10.02860	10.45433	26
35	9.54601	9.97135	9.57466	10.42534	10.02865	10.45399	25
36	9.54635	9.97130	9.57504	10.42496	10.02870	10.45365	24
37	9.54668	9.97126	9.57543	10.42457	10.02874	10.45332	23
38	9.54702	9.97121	9.57581	10.42419	10.02879	10.45298	22
39	9.54735	9.97116	9.57619	10.42381	10.02884	10.45265	21
40	9.54769	9.97111	9.57658	10.42342	10.02889	10.45231	20
41	9.54802	9.97106	9.57696	10.42304	10.02893	10.45198	19
42	9.54836	9.97102	9.57734	10.42266	10.02898	10.45164	18
43	9.54869	9.97097	9.57772	10.42228	10.02903	10.45131	17
44	9.54903	9.97092	9.57810	10.42190	10.02908	10.45097	16
45	9.54936	9.97087	9.57849	10.42151	10.02913	10.45064	15
46	9.54969	9.97083	9.57887	10.42113	10.02917	10.45031	14
47	9.55003	9.97078	9.57925	10.42075	10.02922	10.44997	13
48	9.55036	9.97073	9.57693	10.42037	10.02927	10.44964	12
49	9.55069	9.97068	9.58001	10.41999	10.02932	10.44931	11
50	9.55102	9.97063	9.58039	10.41961	10.02937	10.44898	10
51	9.55136	9.97059	9.58077	10.41923	10.02941	10.44864	9
52	9.55169	9.97054	9.58115	10.41885	10.02946	10.44831	8
53	9.55202	9.97049	9.58153	10.41847	10.02951	10.44798	7
54	9.55235	9.97044	9.58191	10.41809	10.02956	10.44765	6
55	9.55268	9.97039	9.58229	10.41771	10.02561	10.44732	5
56	9.55301	9.97034	9.58266	10.41733	10.02965	10.44699	4
57	9.55334	9.97030	9.58304	10.41696	10.02970	10.44666	3
58	9.55367	9.97025	9.58342	10.41658	10.02975	10.44633	2
59	9.55400	9.97020	9.58380	10.41620	10.02980	10.44600	1
60	9.55433	9.97015	9.58418	10.41582	10.02985	10.44567	0
	Co-ſine.	Sine.	Co-tang.	Tangent.	Co-ſecant	Secant.	M.

69 Degrees.

A Table of Artificial Sines, Tang. and Sec. 21 Degrees.

M.	Sine.	Co-ſine.	Tangent.	Co-tang.	Secant.	Co-ſecant	
0	9.55433	9.97015	9.58418	10.41582	10.02985	10.44568	60
1	9.55466	9.97010	9.58455	10.41544	10.02990	10.44534	59
2	9.55499	9.97005	9.58493	10.41507	10.02995	10.44501	58
3	9.55531	9.97001	9.58531	10.41469	10.02999	10.44468	57
4	9.55564	9.96996	9.58569	10.41431	10.03004	10.44436	56
5	9.55597	9.96991	9.58606	10.41394	10.03009	10.44403	55
6	9.55630	9.96986	9.58644	10.41356	10.03014	10.44370	54
7	9.55663	9.96981	9.58681	10.41319	10.03019	10.44337	53
8	9.55695	9.96976	9.58719	10.41281	10.03024	10.44305	52
9	9.55728	9.96971	9.58757	10.41243	10.03029	10.44272	51
10	9.55761	9.96966	9.58794	10.41206	10.03034	10.44239	50
11	9.55793	9.96962	9.58832	10.41168	10.03038	10.44277	49
12	9.55826	9.96957	9.58869	10.41131	10.03043	10.44104	48
13	9.55858	9.96952	9.58907	10.41093	10.03048	10.44142	47
14	9.55891	9.96947	9.58944	10.41056	10.03053	10.44109	46
15	9.55923	9.96942	9.58981	10.41019	10.03058	10.44077	45
16	9.55956	9.96937	9.59019	10.40981	10.03063	10.44044	44
17	9.55988	9.96932	9.59056	10.40944	10.03068	10.44012	43
18	9.56021	9.96927	9.59094	10.40906	10.03073	10.43979	42
19	9.56053	9.96922	9.59131	10.40869	10.03078	10.43947	41
20	9.56085	9.96917	9.59168	10.40832	10.03083	10.43914	40
21	9.56118	9.96912	9.59205	10.40795	10.03088	10.43882	39
22	9.56150	9.96907	9.59243	10.40757	10.03093	10.43850	38
23	9.56182	9.96903	9.59280	10.40720	10.03097	10.43818	37
24	9.56215	9.96898	9.59317	10.40683	10.03102	10.43785	36
25	9.56247	9.96893	9.59354	10.40646	10.03107	10.43753	35
26	9.56279	9.96888	9.59391	10.40609	10.03112	10.43721	34
27	9.56311	9.96883	9.59428	10.40571	10.03117	10.43689	33
28	9.56343	9.96878	9.59466	10.40534	10.03122	10.43657	32
29	9.56375	9.96873	9.59503	10.40497	10.03127	10.43625	31
30	9.56408	9.96868	9.59540	10.40460	10.03132	10.43592	30
31	9.56440	9.96863	9.59577	10.40423	10.03137	10.43560	29
32	9.56472	9.96858	9.59614	10.40386	10.03142	10.43528	28
33	9.56504	9.96853	9.59651	10.40349	10.03147	10.43496	27
34	9.56536	9.96848	9.59688	10.40312	10.03152	10.43464	26
35	9.56568	9.96843	9.59725	10.40275	10.03157	10.43432	25
36	9.56599	9.96838	9.59762	10.40238	10.03162	10.43400	24
37	9.56631	9.96833	9.59799	10.40201	10.03167	10.43369	23
38	9.56663	9.96828	9.59835	10.40165	10.03172	10.43337	22
39	9.56695	9.96823	9.59872	10.40128	10.03177	10.43305	21
40	9.56727	9.96818	9.59909	10.40091	10.03182	10.43273	20
41	9.56759	9.96813	9.59946	10.40054	10.03187	10.43241	19
42	9.56790	9.96808	9.59983	10.40017	10.03192	10.43210	18
43	9.56822	9.96803	9.60019	10.39981	10.03197	10.43178	17
44	9.56854	9.96798	9.60056	10.39944	10.03202	10.43146	16
45	9.56886	9.96793	9.60093	10.39907	10.03207	10.43114	15
46	9.56917	9.96788	9.60130	10.39870	10.03212	10.43083	14
47	9.56949	9.96783	9.60166	10.39834	10.03217	10.43051	13
48	9.56980	9.96778	9.60203	10.39797	10.03222	10.43020	12
49	9.57012	9.96772	9.60239	10.39760	10.03228	10.42988	11
50	9.57044	9.96767	9.60276	10.39724	10.03232	10.42956	10
51	9.57075	9.96762	9.60313	10.39687	10.03238	10.42925	9
52	9.57107	9.96757	9.60349	10.39651	10.03243	10.42893	8
53	9.57138	9.96752	9.60386	10.39614	10.03248	10.42862	7
54	9.57169	9.96747	9.60422	10.39578	10.03253	10.42830	6
55	9.57201	9.96742	9.60459	10.39541	10.03258	10.42799	5
56	9.57232	9.96737	9.60495	10.39505	10.03263	10.42768	4
57	9.57264	9.96732	9.60532	10.39468	10.03268	10.42736	3
58	9.57295	9.96727	9.60568	10.39432	10.03273	10.42705	2
59	9.57326	9.96722	9.60605	10.39395	10.03278	10.42674	1
60	9.57357	9.96717	9.60641	10.39359	10.03283	10.42642	0
	Co-ſine.	Sine.	Co-tang.	Tangent.	Co-ſecant	Secant.	M.

68 Degrees.

A Table of Artificial Sines, Tang. and Sec. 22 Degrees.

M.	Sine.	Co-ſine.	Tangent.	Co-tang.	Secant.	Co-ſecant	
0	9.57358	9.96717	9.60641	10.39359	10.03283	10.42642	60
1	9.57389	9.96711	9.60677	10.39323	10.03289	10.42611	59
2	9.57420	9.96706	9.60714	10.39286	10.03294	10.42580	58
3	9.57451	9.96701	9.60750	10.39250	10.03299	10.42549	57
4	9.57482	9.96696	9.60786	10.39214	10.03304	10.42518	56
5	9.57514	9.96691	9.60823	10.39177	10.03309	10.42486	55
6	9.57545	9.96686	9.60859	10.39141	10.03314	10.42455	54
7	9.57576	9.96681	9.60895	10.39105	10.03319	10.42424	53
8	9.57607	9.96676	9.60931	10.39069	10.03324	10.42393	52
9	9.57638	9.96670	9.60967	10.39033	10.03330	10.42362	51
10	9.57669	9.96665	9.61004	10.38996	10.03335	10.42331	50
11	9.57700	9.96660	9.61040	10.38960	10.03340	10.42300	49
12	9.57731	9.96655	9.61076	10.38924	10.03345	10.42269	48
13	9.57762	9.96650	9.61112	10.38888	10.03350	10.42238	47
14	9.57793	9.96645	9.61148	10.38852	10.03355	10.42207	46
15	9.57824	9.96640	9.61184	10.38816	10.03360	10.42176	45
16	9.57854	9.96634	9.61220	10.38780	10.03366	10.42145	44
17	9.57885	9.96629	9.61256	10.38744	10.03371	10.42115	43
18	9.57916	9.96624	9.61292	10.38708	10.03376	10.42084	42
19	9.57947	9.9661	9.61328	10.38672	10.03381	10.42053	41
20	9.57978	9.96614	9.61364	10.38636	10.03386	10.42022	40
21	9.58008	9.96608	9.61430	10.38600	10.03392	10.41992	39
22	9.58039	9.96603	9.61436	10.38564	10.03397	10.41961	38
23	9.58070	9.96598	9.61472	10.38528	10.03402	10.41930	37
24	9.58100	9.96593	9.61508	10.38492	10.03407	10.41899	36
25	9.58131	9.96588	9.61544	10.38456	10.03412	10.41869	35
26	9.58162	9.96582	9.61579	10.38421	10.03418	10.41838	34
27	9.58192	9.96577	9.61615	10.38385	10.03423	10.41808	33
28	9.58223	9.96572	9.61651	10.38349	10.03428	10.41777	32
29	9.58253	9.96567	9.61687	10.38313	10.03433	10.41747	31
30	9.58284	9.96562	9.61722	10.38278	10.03438	10.41716	30
31	9.58314	9.96556	9.61758	10.38242	10.03444	10.41686	29
32	9.58345	9.96551	9.61794	10.38206	10.03449	10.41655	28
33	9.58375	9.96546	9.61830	10.38170	10.03454	10.41625	27
34	9.58406	9.96541	9.61865	10.38135	10.03459	10.41594	26
35	9.58436	9.96535	9.61901	10.38099	10.03465	10.41564	25
36	9.58467	9.96530	9.61936	10.38063	10.03470	10.41533	24
37	9.58497	9.96525	9.61972	10.38028	10.03475	10.41503	23
38	9.58527	9.96520	9.62008	10.37992	10.03480	10.41473	22
39	9.58557	9.96514	9.62043	10.37957	10.03486	10.41443	21
40	9.58588	9.96509	9.62079	10.37921	10.03491	10.41412	20
41	9.58618	9.96504	9.62114	10.37886	10.03496	10.41382	19
42	9.58648	9.96498	9.62150	10.37850	10.03502	10.41352	18
43	9.58678	9.96493	9.62185	10.37815	10.03507	10.41322	17
44	9.58708	9.96488	9.62221	10.37779	10.03512	10.41291	16
45	9.58739	9.96483	9.62256	10.37744	10.03517	10.41261	15
46	9.58769	9.96477	9.62291	10.37708	10.03523	10.41231	14
47	9.58799	9.96472	9.62327	10.37673	10.03528	10.41201	13
48	9.58829	9.96467	9.62362	10.37638	10.03533	10.41171	12
49	9.58859	9.96461	9.62398	10.37602	10.03539	10.41141	11
50	9.58889	9.96456	9.62433	10.37567	10.03544	10.41111	10
51	9.58919	9.96451	9.62468	10.37532	10.03549	10.41081	9
52	9.58949	9.96445	9.62504	10.37496	10.03555	10.41051	8
53	9.58979	9.96440	9.62539	10.37461	10.03560	20.41021	7
54	9.59009	9.96435	9.62574	10.37426	10.03565	10.40991	6
55	9.59039	9.96429	9.62609	10.37391	10.03571	10.40961	5
56	9.59069	9.96424	9.62645	10.37355	10.03576	10.40931	4
57	9.59098	9.96419	9.62680	10.37320	10.03581	10.40902	3
58	9.59128	9.96413	9.62715	10.37285	10.03587	10.40872	2
59	9.59158	9.96408	9.62750	10.37250	10.03592	10.40842	1
60	9.59188	9.96403	9.62785	10.37215	10.03597	10.40812	0
	Co-ſine.	Sine.	Co-tang.	Tangent.	Co-ſecant	Secant.	M.

67 Degrees.

A Table of Artificial Sines, Tang. and Sec. 23 Degrees.

M.	Sine.	Co-Sine.	Tangent.	Co-tang.	Secant.	Co-ſecant	
0	9.59188	9.96403	9.63785	10.37215	10.03597	10.40812	60
1	9.59217	9.96397	9.63820	10.37180	10.03603	10.40782	59
2	9.59247	9.96392	9.63855	10.37145	10.03608	10.40753	58
3	9.59277	9.96386	9.63890	10.37109	10.03613	10.40723	57
4	9.59307	9.96381	9.63925	10.37074	10.03616	10.40693	56
5	9.59336	9.96376	9.63961	10.37039	10.03624	10.40664	55
6	9.59366	9.96370	9.63996	10.37004	10.03630	10.40634	54
7	9 59396	9.96364	9.63031	10.36969	10.03635	10.40704	53
8	9.59425	9 96360	9.63066	10.36934	10.03640	10.40575	52
9	9.59455	9.96354	9.63101	10.36899	10 03646	10.40545	51
10	9.59484	9.96349	9.63135	10.36865	10.03651	10.40516	50
11	9.59514	9.96343	9.63170	10 36830	10.03657	10.40486	49
12	9.59543	9.96338	9.63205	10.36795	10.03662	10.40457	48
13	9.59573	9.96333	9.63240	10.36760	10.03667	10.40427	47
14	9.59602	9.96327	9.63275	10.36725	10.03673	10.40398	46
15	9.59632	9.96322	9.63310	10.36690	10.03678	10.40368	45
16	9.59661	9.96316	9.63345	10.36655	10.03684	10.40339	44
17	9.59690	9.96311	9.63379	10.36620	10.03689	10.40310	43
18	9.59720	9.96305	9.63414	10.36586	10.03695	10.40280	42
19	9.59749	9.96300	9.63449	10.36551	10.03700	10.40251	41
20	9.59778	9.96294	9.63484	10.36516	10.03706	10.40222	40
21	9.59808	9.96289	9.63518	10.36481	10.03711	10.40192	39
22	9.59837	9.96284	9.63553	10.36447	10.03716	10.40163	38
23	9.59896	9.96278	9.63588	10.36412	10.03722	10.40134	37
24	9.59895	9.96273	9.63623	10.36377	10.03727	10.40105	36
25	9.59924	9.96267	9.63657	10.36343	10.03733	10.40076	35
26	9 59954	9.96262	9.63692	10.36308	10.03738	10.40046	34
27	9.59983	9.96256	9.63726	10.36273	10.03744	10.40017	33
28	9.60012	9.96251	9.63761	10.36239	10.03749	10.39988	32
29	9.60041	9.96245	9.63796	10.36204	10.03755	10.39959	31
30	9.60070	9.96240	9.63830	10.36170	10.03760	10.39930	30
31	9.60099	9.96234	9.63865	10.36135	10.03766	10.39901	29
32	9.60128	9.96229	9.63899	10.36101	10.03771	10.39872	28
33	9.60157	9.96223	9.63934	10.36066	10.03777	10.39843	27
34	9.60186	9.96218	9.63968	10.36032	10.03782	10.39814	26
35	9.60215	9.96212	9.64003	10.35997	10.03788	10.39785	25
36	9.60244	9.96207	9.64037	10.35963	10.03793	10.39756	24
37	9.60273	9.96201	9.64072	10.35928	10.03798	10.39727	23
38	9.60302	9.96196	9.64106	10.35894	10 03804	10.39698	22
39	9.60331	9.96190	9.64140	10.35860	10.03810	10.39669	21
40	9.60359	9.96185	9.64175	10.35825	10.03815	10.39641	20
41	9.60388	9.96179	9.64209	10.35791	10.03821	10.39612	19
42	9.60417	9.96174	9.64243	10.35757	10.03826	10.39583	18
43	9.60446	9.96168	9.64278	10.35722	10.03832	10.39554	17
44	9.60474	9.96162	9.64312	10.35688	10.03838	10.39525	16
45	9.60503	9.96157	9.64346	10.35654	10.03843	10.39497	15
46	9.60532	9.96151	9.64381	10.35619	10.03849	10.39468	14
47	9.60561	9.96146	9.64415	10.35585	10.03855	10.39439	13
48	9.60589	9.96140	9.64449	10.35551	10.03860	10.39411	12
49	9.60618	9.96135	9.64483	10.35517	10 03866	10.39382	11
50	9.60646	9 96129	9.64517	10.35483	10.03871	10.39353	10
51	9.60675	9 96123	9.64552	10.35448	10.03877	10.39325	9
52	9.60704	9.96118	9.64586	10.35414	10.03882	10.39296	8
53	9.60732	9.96112	9.64620	10.35380	10.03888	10.39268	7
54	9.60761	9.96107	9.64654	10.35346	10.03893	10.39239	6
55	9.60789	9.96101	9.64688	10.35312	10 03999	10.39211	5
56	9.60818	9.96095	9.64722	10.35278	10.03905	10.39182	4
57	9.60846	9.96090	9.64756	10.35244	10.03910	10.39154	3
58	9.60874	9.96084	9.64790	10.35210	10 03916	10.39125	2
59	9 60903	9.96079	9.64824	10.35176	10.03921	10.39097	1
60	9.60931	9.96073	9.64858	10.35142	10.03927	10.39069	0
	Co-ſine.	Sine.	Co tang.	Tangent.	Co-ſecan.	Secant.	M.

66 Degrees.

A Table of Artificial Sines, Tang. and Sec. 24 Degrees.

M.	Sine.	Co-ſine.	Tangent.	Co-tang.	Secant.	Co-ſecant	
0	9.60931	9.96073	9.64858	10.35142	10.03927	10.39069	60
1	9.60960	9.96067	9.64892	10.35108	10.03933	10.39040	59
2	9.60988	9.96062	9.64926	10.35074	10.03938	10.39012	58
3	9.61016	9.96056	9.64960	10.35040	10.03944	10.38984	57
4	9.61045	9.96050	9.64994	10.35006	10.03950	10.38955	56
5	9.61073	9.96045	9.65028	10.34972	10.03955	10.38927	55
6	9.61101	9.96039	9.65062	10.34938	10.03961	10.38899	54
7	9.61129	9.96034	9.65096	10.34904	10.03966	10.38871	53
8	9.61158	9.96028	9.65130	10.34870	10.03972	10.38842	52
9	9.61186	9.96022	9.65164	10.34836	10.03978	10.38814	51
10	9.61214	9.96017	9.65197	10.34803	10.03983	10.38786	50
11	9.61242	9.96011	9.65231	10.34769	10.03989	10.38758	49
12	9.61270	9.96005	9.65265	10.34735	10.03995	10.38730	48
13	9.61298	9.95999	9.65299	10.34701	10.04000	10.38702	47
14	9.61326	9.95994	9.65333	10.34667	10.04006	10.38674	46
15	9.61354	9.95988	9.65366	10.34634	10.04012	10.38646	45
16	9.61382	9.95982	9.65400	10.34600	10.04018	10.38617	44
17	9.61411	9.95977	9.65434	10.34566	10.04023	10.38589	43
18	9.61438	9.95971	9.65467	10.34533	10.04029	10.38561	42
19	9.61466	9.95965	9.65501	10.34499	10.04035	10.38534	41
20	9.61494	9.95960	9.65535	10.34465	10.04040	10.38506	40
21	9.61522	9.95954	9.65568	10.34432	10.04046	10.38478	39
22	9.61550	9.95948	9.65602	10.34398	10.04052	10.38450	38
23	9.61578	9.95942	9.65636	10.34364	10.04058	10.38422	37
24	9.61606	9.95937	9.65669	10.34331	10.04063	10.38394	36
25	9.61634	9.95931	9.65703	10.34297	10.04069	10.38366	35
26	9.61662	9.95925	9.65736	10.34264	10.04075	10.38338	34
27	9.61689	9.95920	9.65770	10.34230	10.04080	10.38311	33
28	9.91717	9.95914	9.65803	10.34197	10.04086	10.38283	32
29	9.61745	9.95908	9.65837	10.34163	10.04092	10.38255	31
30	9.61773	9.95902	9.65870	10.34130	10.04098	10.38227	30
31	9.61800	9.95897	9.65904	10.34096	10.04103	10.38200	29
32	9.61828	9.95891	9.65937	10.34063	10.04109	10.38172	28
33	9.61856	9.95885	9.65971	10.34029	10.04115	10.38144	27
34	9.61883	9.95879	9.66004	10.33996	10.04121	10.38117	26
35	9.61911	9.95873	9.66038	10.33962	10.04127	10.38089	25
36	9.61939	9.95868	9.66071	10.33929	10.04132	10.38061	24
37	9.61966	9.95862	9.66104	10.33896	10.04138	10.38034	23
38	9.61994	9.95856	9.66138	10.33862	10.04144	10.38006	22
39	9.62021	9.95850	9.66171	10.33829	10.04150	10.37979	21
40	9.62049	9.95844	9.66204	10.33796	10.04156	10.37951	20
41	9.62076	9.95839	9.66238	10.33762	10.04161	10.37924	19
42	9.62104	9.95833	9.66271	10.33729	10.04167	10.37896	18
43	9.62131	9.95827	9.66304	10.33696	10.04173	10.37869	17
44	9.62159	9.95821	9.66337	10.33663	10.04179	10.37841	16
45	9.62186	9.95815	9.66371	10.33629	10.04185	10.37814	15
46	9.62214	9.95810	9.66404	10.33596	10.04190	10.37786	14
47	9.62241	9.95804	9.66437	10.33563	10.04196	10.37759	13
48	9.62268	9.95798	9.66470	10.33530	10.04202	10.37732	12
49	9.62296	9.95792	9.66503	10.33497	10.04208	10.37704	11
50	9.62323	9.95786	9.66537	10.33463	10.04214	10.37677	10
51	9.62350	9.95780	9.66570	10.33430	10.04220	10.37650	9
52	9.62377	9.95775	9.66603	10.33397	10.04225	10.37623	8
53	5.62405	9.95769	9.66636	10.33364	10.04231	10.37595	7
54	9.62432	9.95763	9.66669	10.33331	10.04237	10.37568	6
55	9.62459	9.95757	9.66702	10.33298	10.04243	10.37541	5
56	9.62486	9.95751	9.66735	10.33265	10.04249	10.37514	4
57	9.62513	9.95745	9.66768	10.33232	10.04255	10.37487	3
58	9.62541	9.95739	9.66801	10.33199	10.04261	10.37459	2
59	9.62568	9.95733	9.66834	10.33166	10.04267	10.37432	1
60	9.62595	9.95728	9.66867	10.33133	10.04272	10.37405	0
M	Co Sine.	Sine.	Co-tang.	Tangent.	Co-ſecant	Secant.	M.

65 Degrees.

A Table of Artificial Sines, Tang. and Sec. 25 Degrees.

M.	Sine.	Co-ſine.	Tangent.	Co-tang.	Secant.	Co-ſecant	
0	9.62595	9.95728	9.66867	10.33133	10.04272	10.37405	60
1	9.62622	9.95722	9.66900	10.33100	10.04278	10.37378	59
2	9.62649	9.95716	9.66933	10.33067	10.04284	10.37351	58
3	9.62676	9.95710	9.66966	10.33034	10.04290	10.37324	57
4	9.62703	9.95704	9.66999	10.33001	10.04296	10.37297	56
5	9.62730	9.95698	9.67032	10.32968	10.04302	10.37270	55
6	9.62757	9.95692	9.67065	10.32935	10.04308	10.37243	54
7	9.62784	9.95686	9.67098	10.32902	10.04314	10.37216	53
8	9.62811	9.95680	9.67131	10.32869	10.04320	10.37189	52
9	9.62838	9.95674	9.67163	10.32837	10.04326	10.37162	51
10	9.62865	9.95668	9.67196	10.32804	10.04332	10.37135	50
11	9.62892	9.95662	9.67229	10.32771	10.04337	10.37108	49
12	9.92918	9.95657	9.67262	10.32738	10.04343	10.37082	48
13	9.62945	9.95651	9.67295	10.32705	10.04349	10.37055	47
14	9.62972	9.95645	9.67327	10.32673	10.04355	10.37028	46
15	9.62999	9.95639	9.67360	10.32640	10.04361	10.37001	45
16	9.63026	9.95633	9.67393	10.32607	10.04367	10.36974	44
17	9.63052	9.95627	9.67426	10.32574	10.04373	10.36948	43
18	9.63079	9.95621	9.67458	10.32542	10.04379	10.36921	42
19	9.63106	9.95615	9.67401	10.32509	10.04385	10.36894	41
20	9.63133	9.95609	9.67524	10.32476	10.04391	10.36867	40
21	9.63160	9.95603	9.67556	10.32444	10.04397	10.36841	39
22	9.63186	9.95597	9.67589	10.32411	10.04403	10.36814	38
23	9.63212	9.95591	9.67622	10.32378	10.04409	10.36787	37
24	9.63239	9.95585	9.67654	10.32346	10.04415	10.36761	36
25	9.63266	9.95579	9.67687	10.32313	10.04421	10.36734	35
26	9.63292	9.95573	9.67719	10.32281	10.04427	10.36708	34
27	9.63319	9.95567	9.67752	10.32248	10.04433	10.36681	33
28	9.63345	9.95561	9.67785	10.32215	10.04439	10.36655	32
29	9.63372	9.95555	9.67817	10.32183	10.04445	10.36628	31
30	9.63398	9.95549	9.67850	10.32150	10.04451	10.36602	30
31	9.63425	9.95543	9.67882	10.32118	10.04457	10.36575	29
32	9.63451	9.95537	9.67915	10.32085	10.04463	10.36549	28
33	9.63478	9.95531	9.67947	10.32053	10.04469	10.36522	27
34	9.63504	9.95525	9.67979	10.32020	10.04475	10.36496	26
35	9.63531	9.95519	9.68012	10.31988	10.04481	10.36469	25
36	9.63557	9.95513	9.68044	10.31956	10.04487	10.36443	24
37	9.63583	9.95507	9.68077	10.31923	10.04493	10.36417	23
38	9.63610	9.95500	9.68109	10.31891	10.04500	10.36390	22
39	9.63636	9.95494	9.68142	10.31858	10.04506	10.36364	21
40	9.63662	9.95488	9.68174	10.31826	10.04512	10.36338	20
41	9.63689	9.95482	9.68206	10.31794	10.04518	10.36311	19
42	9.63715	9.95476	9.68239	10.31761	10.04524	10.36285	18
43	9.63741	9.95470	9.68271	10.31729	10.04530	10.36259	17
44	9.63767	9.95464	9.68303	10.31697	10.04536	10.36233	16
45	9.63793	9.95458	9.68336	10.31664	10.04542	10.36206	15
46	9.63820	9.95452	9.68368	10.31632	10.04548	10.36180	14
47	9.63846	9.95446	9.68400	10.31600	10.04554	10.36154	13
48	9.63872	9.95440	9.68432	10.31568	10.04560	10.36128	12
49	9.63898	9.95434	9.68465	10.31535	10.04566	10.36102	11
50	9.63924	9.95427	9.68497	10.31503	10.04573	10.36076	10
51	9.63950	9.95421	9.68529	10.31471	10.04579	10.36050	9
52	9.63976	9.95415	9.68561	10.31439	10.04585	10.36024	8
53	9.64002	9.95409	9.68593	10.31407	10.04591	10.35998	7
54	9.64028	9.95403	9.68626	10.31374	10.04597	10.35972	6
55	9.64054	9.95397	9.68658	10.31342	10.04603	10.35946	5
56	9.64080	9.95391	9.68690	10.31310	10.04609	10.35920	4
57	9.64106	9.95384	9.68722	10.31278	10.04616	10.35894	3
58	9.64132	9.95378	9.68754	10.31246	10.04622	10.35868	2
59	9.64158	9.95372	9.68786	10.31214	10.04628	10.35842	1
60	9.64184	9.95366	9.68818	10.31182	10.04634	10.35816	0
	Co-ſine.	Sine.	Co-tang.	Tangent.	Co-ſecant	Secant.	M.

64 Degrees.

A Table of Artificial Sines, Tang. and Sec. 26 Degrees,

M.	Sine.	Co-ſine.	Tangent.	Co-tang.	Secant.	Co-ſecant	
0	9.64184	9.95366	9.68818	10.31182	10.04634	10.35816	60
1	9.64210	9.95360	9.68850	10.31149	10.04640	10.35790	59
2	9.64236	9.95354	9.68882	10.31118	10.04646	10.35764	58
3	9.64262	9.95348	9.68914	10.31086	10.04652	10.35738	57
4	9.64288	9.95341	9.68946	10.31054	10.04659	10.35712	56
5	9.64313	9.95335	9.68978	10.31022	10.04665	10.35687	55
6	9.64339	9.95329	9.69010	10.30990	10.04671	10.35661	54
7	9.64365	9.95323	9.69042	10.30958	10.04677	10.35635	53
8	9.64391	9.95317	9.69074	10.30926	10.04683	10.35609	52
9	9.64417	9.95310	9.69106	10.30894	10.04690	10.35583	51
10	9.64442	9.95304	9.69138	10.30862	10.04696	10.35558	50
11	9.64468	9.95298	9.69170	10.30830	10.04702	10.35532	49
12	9.64494	9.95292	9.69202	10.30798	10.04708	10.35506	48
13	9.64519	9.95286	9.69234	10.30766	10.04714	10.35481	47
14	9.64545	9.95279	9.69266	10.30734	10.04721	10.35455	46
15	9.64571	9.95273	9.69297	10.30703	10.04727	10.35429	45
16	9.64596	9.95267	9.69329	10.30671	10.04733	10.35404	44
17	9.64622	9.95261	9.69361	10.30639	10.04739	10.35378	43
18	9.64647	9.95254	9.69393	10.30607	10.04746	10.35353	42
19	9.64673	9.95248	9.69425	10.30575	10.04752	10.35327	41
20	9.64698	9.95242	9.69457	10.30543	10.04758	10.35302	40
21	9.64724	9.95236	9.69488	10.30512	10.04764	10.35276	39
22	9.64749	9.95229	9.69520	10.30480	10.04771	10.35251	38
23	9.64775	9.95223	9.69552	10.30448	10.04777	10.35225	37
24	9.64800	9.95217	9.69584	10.30416	10.04783	10.35200	36
25	9.64826	9.95211	9.69615	10.30385	10.04789	10.35174	35
26	9.64851	9.95204	9.69647	10.30353	10.04796	10.35149	34
27	9.64877	9.95198	9.69679	10.30321	10.04802	10.35123	33
28	9.64902	9.95192	9.69710	10.30290	10.04808	10.35098	32
29	9.64927	9.95185	9.69742	10.30258	10.04815	10.35073	31
30	9.64953	9.95179	9.69774	10.30226	10.04821	10.35047	30
31	9.65978	9.95173	9.69805	10.30195	10.04827	10.35022	29
32	9.65003	9.95167	9.69837	10.30163	10.04833	10.34997	28
33	9.65029	9.95160	9.69868	10.30132	10.04840	10.34971	27
34	9.65054	9.95154	9.69900	10.30100	10.04846	10.34946	26
35	9.65079	9.95148	9.69932	10.30068	10.04852	10.34921	25
36	9.65104	9.95141	9.69963	10.30037	10.04859	10.34896	24
37	9.65130	9.95135	9.69995	10.30005	10.04865	10.34870	23
38	9.65155	9.95129	9.60026	10.29974	10.04871	10.34845	22
39	9.65180	9.95122	9.60058	10.29942	10.04878	10.34820	21
40	9.65205	9.95116	9.60089	10.29911	10.04884	10.34795	20
41	9.65230	9.95110	9.60121	10.29879	10.04890	10.34770	19
42	9.65255	9.95103	9.60152	10.29848	10.04897	10.34745	18
43	9.65281	9.95097	9.60184	10.29816	10.04903	10.34719	17
44	9.65306	9.95090	9.60215	10.29785	10.04910	10.34694	16
45	9.65331	9.95084	9.60247	10.29753	10.04916	10.34669	15
46	9.65356	9.95078	9.60278	10.29722	10.04922	10.34644	14
47	9.65381	9.95071	9.60309	10.29691	10.04929	10.34619	13
48	9.05406	9.95065	9.60341	10.29659	10.04935	10.34594	12
49	9.65431	9.95059	9.60372	10.29628	10.04941	10.34569	11
50	9.65456	9.95052	9.60404	10.29596	10.04948	10.34544	10
51	9.65481	9.95046	9.60435	10.29565	10.04954	10.34519	9
52	9.65506	9.95039	9.60466	10.29534	10.04961	10.34494	8
53	9.65531	9.95033	9.60498	10.29502	10.04967	10.34469	7
54	9.65556	9.95027	9.60529	10.29471	10.04973	10.34444	6
55	9.65580	9.95020	9.60560	10.29440	10.04980	10.34419	5
56	9.65605	9.95014	9.60592	10.29408	10.04986	10.34395	4
57	9.65630	9.95007	9.60623	10.29377	10.04993	10.34370	3
58	9.65655	9.95001	9.60654	10.29346	10.04999	10.34345	2
59	9.65680	9.94994	9.60685	10.29315	10.05005	10.34320	1
60	9.65705	9.94988	9.60717	10.29283	10.05012	10.34295	0
	Co-ſine.	Sine.	Co-tang.	Tangent.	Co-ſecant	Secant.	M.

63 Degrees.

A Table of Artificial Sines, Tang. and Sec. 27 Degrees.

M.	Sine.	Co-ſine.	Tangent.	Co-tang.	Secant.	Co-ſecant	
0	9.65705	9.94988	9.70717	10.29283	10.05012	10.34295	60
1	9.65729	9.94982	9.70748	10.29252	10.05018	10.34270	59
2	9.65754	9.94975	9.70779	10.29221	10 05025	10.34246	58
3	9.65769	9.94969	9.70810	10.29190	10.05031	10.34221	57
4	9.65804	9.94962	9.70841	10.29159	10.05038	10.34196	56
5	9.65828	9.94956	9.70873	10.29127	10.05044	10.34172	55
6	9.65853	9.94949	9.70904	10.29096	10 05051	10.34147	54
7	9.65878	9.94943	9.70935	10.29065	10.05057	10.34122	53
8	9.65902	9.94936	9.70966	10.29034	10.05064	10.34097	52
9	9.65927	9.94930	9.70997	10.29003	10.05070	10.34073	51
10	9.65952	9.94923	9.71028	10.28972	10.05077	10.34048	50
11	9.65976	9.94917	9.71059	10.28941	10.05083	10.34024	49
12	9 66001	9.94910	9.71090	10.28910	10.05089	10.33999	48
13	9.66025	9.94904	9.71121	10.28879	10.05096	10.33974	47
14	9.66050	9.94898	9.71153	10.28847	10 05102	10.33950	46
15	9.66075	9.94891	9.71184	10.28816	10.05109	10.33925	45
16	9.66099	9.94884	9.71215	10.28785	10.05115	10.33901	44
17	9.66124	9.94878	9.71246	10.28754	10.05122	10.33876	43
18	9.66148	9.94871	9.71277	10.28723	10.05129	10.33852	42
19	9.66173	9.94865	9.71308	10.28692	10.05135	10.33827	41
20	9.66197	9.94858	9.71339	10.28661	10.05142	10.33803	40
21	9.66221	9.94852	9.71370	10.28630	10.05148	10.33789	39
22	9.66246	9.94845	9.71401	10.28599	10.05155	10.33754	38
23	9.66270	9.94839	9.71431	10.28568	10.05161	10.33730	37
24	9.66295	9.94832	9.71462	10.28538	10.05168	10.33705	36
25	9.66319	9.94826	9.71493	10.28507	10.05174	10.33681	35
26	9.66343	9.94819	9.71524	10.28476	10.05181	10.33657	34
27	9.66368	9.94813	9.71555	10.28445	10.05187	10.33632	33
28	9.96392	9.94806	9.71586	10.28414	10.05194	10.33608	32
29	9.66416	9.94799	9.71617	10.28383	10.05201	10.33584	31
30	9.66441	9.94793	9.71648	10.28352	10.05207	10.33559	30
31	9.66465	9.94786	9.71679	10.28321	10.05214	10.33535	29
32	9.66489	9.94780	9.71709	10.28291	10.05220	10.33511	28
33	9.66513	9.94773	9.71740	10.28260	10.05227	10.33487	27
34	9 66537	9.94767	9.71771	10.28229	10.05233	10.33453	26
35	9.66562	9.94760	9.71802	10.28198	10.05240	10.33438	25
36	9 66586	9.94753	9.71833	10.28167	10.05247	10.33414	24
37	9.66610	9.94747	9.71863	10.28137	10.05253	10.33390	23
38	9 66634	9.94740	9.71894	10.28106	10.05260	10.33366	22
39	9.66658	9.94734	9.71925	10.28075	10.05266	10.33342	21
40	9.66682	9.94727	9.71955	10.28045	10 05273	10.33318	20
41	9.66706	9.94720	9.71986	10.28014	10.05280	10.33293	19
42	9 66731	9.94714	9.72017	10.27983	10 05286	10.33269	18
43	9.66755	9.94707	9.72048	10.27952	10.05293	10.33245	17
44	9.66779	9.94700	9.72078	10.27922	10.05300	10.33221	16
45	9.66803	9.94694	9.72109	10.27891	10.05306	10.33197	15
46	9.66827	9.94687	9.72140	10.27860	10.05313	10.33173	14
47	9.66851	9.94680	9.72170	10.27830	10.05320	10.33149	13
48	9.66875	9.94674	9.72201	10.27799	10.05326	10.33125	12
49	9.66899	9.94667	9.72231	10.27769	10 05333	10.33101	11
50	9.66922	9.94660	9.72262	10.27738	10.05340	10.33077	10
51	9.66946	9.94654	9.72293	10.27707	10.05346	10.33054	9
52	9.66970	9.94647	9.72323	10.27678	10.05353	10.33030	8
53	5.66994	9.94640	9.72354	10.27646	10.05360	10.33006	7
54	9.67018	9.94634	9.72384	10.27616	10.05366	10.32982	6
55	9.67042	9.94627	9.72415	10.27585	10.05373	10.32958	5
56	9.67066	9.94620	9.72445	10.27555	10.05380	10.32934	4
57	9.67090	9.94614	9.72476	10.27524	10.05386	10.32910	3
58	9.67113	9.94607	9.72506	10.27493	10.05393	10.32887	2
59	9.67137	9.94600	9.72537	10.27463	10 05400	10.32863	1
60	9.67161	9.94593	9.72567	10.27433	10.15407	10.32839	0
	Co Sine.	Sine.	Co-tang.	Tangent.	Co-ſecant	Secant.	M.

62 Degrees.

A Table of Artificial Sines, Tang. and Sec. 28 Degrees.

M.	Sine.	Co-Sine.	Tangent.	Co-tang.	Secant.	Co-ſecant	
0	9.67161	9.94593	9.72567	10.27433	10.05406	10.32839	60
1	9.67185	9.94587	9.72598	10.27402	10.05413	10.32815	59
2	9.67208	9.94580	9.72628	10.27372	10.05420	10.32792	58
3	9.67232	9.94573	9.72659	10.27341	10.05427	10.32768	57
4	9.67256	9.94567	9.72689	10.2731	10.05433	10.32744	56
5	9.67280	9.94560	9.72720	10.27280	10.05440	10.32720	55
6	9.67303	9.94553	9.72750	10.27250	10.05447	10.32697	54
7	9.67327	9.94546	9.72780	10.27220	10.05454	10.32673	53
8	9.67350	9.94540	9.72811	10.27189	10.05460	10.32650	52
9	9.67374	9.94533	9.72841	10.27159	10.05467	10.32625	51
10	9.67398	9.94526	9.72872	10.27128	10.05474	10.32602	50
11	9.67421	9.94519	9.72902	10.27098	10.05481	10.32579	49
12	9.67445	9.94513	9.72932	10.27068	10.05487	10.32555	48
13	9.67468	9.94506	9.72963	10.27037	10.05494	10.32532	47
14	9.67492	9.94499	9.72993	10.27007	10.05501	10.32508	46
15	9.67515	9.94492	9.73023	10.26977	10.05508	10.32485	45
16	9.67539	9.94485	9.73054	10.26946	10.05515	10.32461	44
17	9.67562	9.94479	9.73084	10.26916	10.05521	10.32438	43
18	9.67586	9.94472	9.73114	10.26886	10.05528	10.32414	42
19	9.67609	9.94465	9.73144	10.26856	10.05535	10.32391	41
20	9.67633	9.94458	9.73175	10.26825	10.05542	10.32367	40
21	9.67656	9.94451	9.73205	10.26795	10.05549	10.32344	39
22	9.67680	9.94445	9.73235	10.26765	10.05555	10.32320	38
23	9.67703	9.94438	9.73265	10.26735	10.05562	10.32297	37
24	9.67726	9.94431	9.73295	10.26705	10.05569	10.32274	36
25	9.67750	9.94424	9.73326	10.26674	10.05576	10.32250	35
26	9.67773	9.94417	9.73356	10.26644	10.05583	10.32227	34
27	9.67796	9.94410	9.73386	10.26614	10.05590	10.32204	33
28	9.67820	9.94404	9.73416	10.26584	10.05596	10.32180	32
29	9.67843	9.94397	9.73446	10.26554	10.05603	10.32157	31
30	9.67866	9.94390	9.73476	10.26524	10.05610	10.32134	30
31	9.67890	9.94383	9.73507	10.26493	10.05617	10.32110	29
32	9.67913	9.94376	9.73537	10.26463	10.05624	10.32087	28
33	9.67936	9.94369	9.73507	10.26433	10.05631	10.32064	27
34	9.67959	9.94362	9.73597	10.26403	10.05638	10.32041	26
35	9.67982	9.94355	9.73627	10.26373	10.05645	10.32018	25
36	9.68006	9.94349	9.73657	10.26343	10.05651	10.31994	24
37	9.68029	9.94342	9.73687	10.26313	10.05658	10.31971	23
38	9.68052	9.94335	9.73717	10.26283	10.05665	10.31948	22
39	9.68075	9.94328	9.73747	10.26253	10.05672	10.31925	21
40	9.68098	9.94321	9.73777	10.26223	10.05679	10.31902	20
41	9.68121	9.94314	9.73897	10.26193	10.05686	10.31879	19
42	9.68144	9.94307	9.73837	10.26163	10.05693	10.31856	18
43	9.68167	9.94300	9.73867	10.26133	10.05700	10.31833	17
44	9.68190	9.94293	9.73897	10.26103	10.05707	10.31810	16
45	9.68213	9.94286	9.73927	10.26073	10.05714	10.31787	15
46	9.68237	9.94279	9.73957	10.26043	10.05721	10.31763	14
47	9.68260	9.94273	9.73987	10.26013	10.05727	10.31740	13
48	9.68282	9.94266	9.74017	10.25983	10.05734	10.31718	12
49	9.68305	9.94259	9.74047	10.25953	10.05741	10.31695	11
50	9.68328	9.94252	9.74077	10.25923	10.05748	10.31672	10
51	9.68351	9.94245	9.74107	10.23893	10.05755	10.31649	9
52	9.68374	9.94238	9.74136	10.25863	10.05762	10.31626	8
53	9.68397	9.94231	9.74166	10.25833	10.05769	10.31604	7
54	9.68420	9.94224	9.74196	10.25803	10.05776	10.31580	6
55	9.68443	9.94217	9.74226	10.25774	10.05783	10.31557	5
56	9.68466	9.94210	9.74256	10.23744	10.05790	10.31534	4
57	9.68489	9.94203	9.74286	10.25714	10.05797	10.31511	3
58	9.68511	9.94196	9.74316	10.25684	10.05804	10.31488	2
59	9.68534	9.94189	9.74345	10.25955	10.05811	10.31469	1
60	9.68557	9.94182	9.74375	10.25625	10.05818	10.31443	0
	Co-ſine.	Sine.	Co tang.	Tangent.	Co-ſecant	Secant.	M.

61 Degrees.

A Table of Artificial Sines, Tang. and Sec. 29 Degrees.

M.	Sine.	Co-ſine.	Tangent.	Co-tang.	Secant.	Co-ſecant	
0	9.68557	9.94182	9.74375	10.25625	10.05818	10.31443	60
1	9.68580	9.94175	9.74405	10.25595	10.05825	10.31420	59
2	9.68603	9.94168	9.74435	10.25565	10.05832	10.31397	58
3	9.68625	9.94161	9.74465	10.25535	10.05839	10.31375	57
4	9.68648	9.94154	9.74495	10.25306	10.05846	10.31352	56
5	9.68671	9.94147	9.74524	10.25476	10.05853	10.31329	55
6	9.68694	9.94140	9.74554	10.25446	10.05860	10.31306	54
7	9.68716	9.94133	9.74583	10.25417	10.05867	10.31284	53
8	9.68739	9.94126	9.74613	10.25387	10.05874	10.31261	52
9	9.68762	9.94119	9.74643	10.25357	10.05881	10.31238	51
10	9.68784	9.94112	9.74673	10.25327	10.05888	10.31216	50
11	9.68807	9.94105	9.74702	10.25298	10.05895	10.31193	49
12	9.68829	9.94098	9.74732	10.25368	10.05902	10.31170	48
13	9.68852	9.94090	9.74762	10.25238	10.05910	10.31148	47
14	9.68875	9.94083	9.74791	10.25209	10.05917	10.31125	46
15	9.68897	9.94076	9.74821	10.25179	10.05924	10.31103	45
16	9.68920	9.94069	9.74851	10.25149	10.05931	10.31080	44
17	9.68942	9.94062	9.74880	10.25120	10.05938	10.31058	43
18	9.68965	9.94055	9.74910	10.25090	10.05945	10.31035	42
19	9.68987	9.94048	9.74939	10.25061	10.05952	10.31013	41
20	9.69010	9.94041	9.74969	10.25031	10.05959	10.30990	40
21	9.69032	9.94034	9.74998	10.25001	10.05966	10.30968	39
22	9.69055	9.94027	9.75028	10.24972	10.05973	10.30945	38
23	9.69077	9.94020	9.75088	10.24942	10.05980	10.30923	37
24	9.69100	9.94012	9.75087	10.24913	10.05988	10.30900	36
25	9.69122	9.94005	9.75117	10.24883	10.05995	10.30878	35
26	9.69144	9.93998	9.75146	10.24854	10.06002	10.30856	34
27	9.69167	9.93991	9.75176	10.24824	10.06009	10.30833	33
28	9.69189	9.93984	9.75205	10.24795	10.06016	10.30811	32
29	9.69212	9.93977	9.75235	10.24765	10.06023	10.30788	31
30	9.69234	9.93970	9.75264	10.24736	10.06030	10.30766	30
31	9.69256	9.93963	9.75294	10.24706	10.06037	10.30744	29
32	9.69279	9.93955	9.75323	10.24677	10.06045	10.30721	28
33	9.69301	9.93948	9.75353	10.24647	10.06052	10.30699	27
34	9.69323	9.93941	9.75382	10.24618	10.06059	10.30677	26
35	9.69345	9.93934	9.75411	10.24588	10.06066	10.30655	25
36	9.69368	9.93927	9.75441	10.24559	10.06073	10.30632	24
37	9.69390	9.93919	9.75470	10.24530	10.06080	10.30610	23
38	9.69412	9.93912	9.75500	10.24500	10.06088	10.30588	22
39	9.69434	9.98905	9.75529	10.24471	10.06095	10.30566	21
40	9.69456	9.93898	9.75558	10.24441	10.06102	10.30544	20
41	9.69479	9.93891	9.75588	10.24412	10.06109	10.30521	19
42	9.69501	9.93884	9.75617	10.24383	10.06116	10.30499	18
43	9.69523	9.93876	9.75647	10.24353	10.06124	10.30477	17
44	9.69545	9.93869	9.75676	10.24324	10.06131	10.30455	16
45	9.69567	9.93862	9.75705	10.24295	10.06138	10.30433	15
46	9.69589	9.93855	9.75735	10.24265	10.06145	10.30411	14
47	9.69611	9.93847	9.75764	10.24236	10.06153	10.30389	13
48	9.69633	9.93840	9.75793	10.24207	10.06160	10.30367	12
49	9.69655	9.93833	9.75822	10.24178	10.06167	10.30345	11
50	9.69677	9.93826	9.75852	10.24148	10.06174	10.30323	10
51	9.69699	9.93819	9.75881	10.24119	10.06181	10.30301	9
52	9.69721	9.93811	9.75910	10.24090	10.06189	10.30279	8
53	9.69743	9.93804	9.75939	10.24060	10.06196	10.30256	7
54	9.69765	9.93797	9.75969	10.24031	10.06203	10.30235	6
55	9.69787	9.93789	9.75998	10.24002	10.06210	10.30213	5
56	9.69809	9.93782	9.76027	10.23973	10.06218	10.30191	7
57	9.69831	9.93775	9.76056	10.23944	10.06225	10.30169	3
58	9.69853	9.93768	9.76086	10.23914	10.06232	10.30147	2
59	9.69875	9.93760	9.76115	10.23885	10.06240	10.30125	1
60	9.69897	9.93753	9.76144	10.23856	10.06247	10.30103	0
M.	Co-ſine.	Sine.	Co-tang.	Tangent.	Co-ſecant	Secant.	M.

60 Degrees.

A Table of Artificial Sines, Tang. and Sec. 30 Degrees.

M.	Sine.	Co-ſine.	Tangent.	Co-tang.	Secant.	Co ſecant	
0	9.69897	9.93753	9.76144	10.23856	10.06247	10.30103	60
1	9.69919	9.93746	9.76173	10.23827	10.06254	10.30081	59
2	9.69941	9.93738	9.76202	10.23798	10.06261	10.30059	58
3	9.69963	9.93731	9.76231	10.23769	10.06269	10.30037	57
4	9.69984	9.93724	9.76261	10.23739	10.06276	10.30016	56
5	9.70006	9.93717	9.76290	10.23710	10.06283	10.29994	55
6	9.70028	9.93709	9.76319	10.23681	10.06291	10.29972	54
7	9.70050	9.93702	9.76348	10.23652	10.06298	10.29950	53
8	9.70072	9.93695	9.76377	10.23623	10.06305	10.29928	52
9	9.70093	9.93687	9.76406	10.23594	10.06313	10.29907	51
10	9.70115	9.93680	9.76435	10.23565	10.06320	10.29885	50
11	9.70137	9.93673	9.76464	10.23536	10.06327	10.29864	49
12	9.70159	9.93665	9.76493	10.23507	10.06335	10.29841	48
13	9.70180	9.93658	9.76522	10.23478	10.06342	10.29820	47
14	9.70202	9.93650	9.76551	10.23449	10.06350	10.29798	46
15	9.70224	9.93643	9.76580	10.23420	10.06357	10.29776	45
16	9.70245	9.93636	9.76609	10.23391	10.06364	10.29735	44
17	9.70267	9.93628	9.76639	10.23361	10.06372	10.29753	43
18	9.70288	9.93621	9.76668	10.23532	10.06379	10.29711	42
19	9.70310	9.93614	9.76697	10.23303	10.06386	10.29690	41
20	9.70332	9.93606	9.76725	10.23274	10.06394	10.29668	40
21	9.70353	9.93599	9.76754	10.23245	10.06401	10.29647	39
22	9.70375	9.93591	9.76783	10.23217	10.06409	10.29625	38
23	9.70396	9.93584	9.76812	10.23188	10.06416	10.29604	37
24	9.70418	9.93577	9.76841	10.23159	10.06423	10.29582	36
25	9.70439	9.93569	9.76870	10.23130	10.06431	10.29561	35
26	9.70461	9.93562	9.76899	10.23101	10.06438	10.29539	34
27	9.70482	9.93554	9.76928	10.23072	10.06446	10.29518	33
28	9.70504	9.93547	9.76957	10.23043	10.06453	10.29496	32
29	9.70525	9.93539	9.76980	10.23014	10.06461	10.29475	31
30	9.70547	9.93532	9.77015	10.22985	10.06468	10.29453	30
31	9.70568	9.93525	9.77044	10.22956	10.06475	10.29432	29
32	9.70590	9.93517	9.77073	10.22927	10.06483	10.29410	28
33	9.70611	9.93510	9.77101	10.22899	10.06490	10.29389	27
34	9.70633	9.93502	9.77130	10.22870	10.06498	10.29367	26
35	9.70654	9.93495	9.77159	10.22841	10.06505	10.29346	25
36	9.70675	9.93487	9.77188	10.22812	10.06513	10.29325	24
37	9.70697	9.93480	9.77217	10.22783	10.06520	10.29303	23
38	9.70718	9.93472	9.77246	10.22754	10.06528	10.29282	22
39	9.70739	9.93465	9.77274	10.22726	10.06535	10.29261	21
40	9.70761	9.93457	9.77303	10.22697	10.06543	10.29239	20
41	9.70782	9.93450	9.77332	10.22668	10.06550	10.29218	19
42	9.70803	9.93442	9.77361	10.22639	10.06558	10.29197	18
43	9.70824	9.93435	9.77390	10.22610	10.06565	10.29175	17
44	9.70846	9.93427	9.77418	10.22582	10.06573	10.29154	16
45	9.70867	9.93420	9.77447	10.22553	10.06580	10.29133	15
46	9.70888	9.93412	9.77476	10.22524	10.06588	10.29112	14
47	9.70909	9.93405	9.77505	10.22495	10.06595	10.29091	13
48	9.70931	9.93397	9.77533	10.22467	10.06603	10.29069	12
49	9.70952	9.93390	9.77562	10.22438	10.06610	10.29048	11
50	9.70973	9.93382	9.77591	10.22409	10.06618	10.29027	10
51	9.70994	9.93375	9.77619	10.22380	10.06625	10.29006	9
52	9.71015	9.93367	9.77648	10.22352	10.06633	10.28985	8
53	9.71036	9.93360	9.77677	10.22323	10.06640	10.28964	7
54	9.71058	9.93352	9.77705	10.22294	10.06648	10.28942	6
55	9.71079	9.93344	9.77734	10.22266	10.06656	10.28921	5
56	9.71100	9.93337	9.77763	10.22237	10.06663	10.28900	4
57	9.71121	9.93329	9.77791	10.22208	10.06671	10.28879	3
58	9.71142	9.93322	9.77820	10.22180	10.06678	10.28858	2
59	9.71163	9.93314	9.77849	10.22151	10.06686	10.28837	1
60	9.71184	9.93307	9.77877	10.22123	10.06693	10.28816	0
	Co-ſine.	Sine.	Co-tang.	Tangent.	Co-ſecant	Secant.	M.

59 Degrees.

A Table of Artificial Sines, Tang. and Sec. 31 Degrees.

M.	Sine.	Co-ſine.	Tangent.	Co-tang.	Secant.	Co-ſecant	
0	9.71184	9.93307	9.77877	10.22123	10.06693	10.28816	60
1	9.71205	9.93299	9.77906	10.22094	10.06701	10.28795	59
2	9.71226	9.93291	9.77935	10.22065	10.06709	10.28774	58
3	9.71247	9.93284	9.77963	10.22037	10,06716	10.28753	57
4	9.71268	9.93276	9.77992	10.22008	10.06724	10.28732	56
5	9.71289	9.93269	9.78021	10.21980	10.06731	10.28711	55
6	9.71310	9.93261	9.78049	10.21951	10.06739	10.28690	54
7	9.71331	9.93253	9.78077	10.21923	10.06747	10.28669	53
8	9.71352	9.93246	9.78106	10.21894	10.06754	10.28648	52
9	9.71373	9.93238	9.78135	10.21865	10.06762	10.28627	51
10	9.71393	9 93230	9.78163	10.21837	10.06770	10.28607	50
11	9.71414	9.93223	9.78192	10.21808	10.06777	10.28586	49
12	9.71435	9.93215	9.78220	10.21780	10.06785	10.28565	48
13	9.71456	9.93207	9.78249	10.21751	10.06792	10.28544	47
14	9.71477	9.93200	9.78277	10.21723	10.06800	10.28523	46
15	9.71498	9.93192	9.78306	10.21694	10.06808	10.28502	45
16	9.71519	9.93184	9.78334	10.21666	10.06816	10.28481	44
17	9.71539	9.93177	9.78363	10.21637	10.06823	10.28461	43
18	9.71560	9.93169	9.78391	10.21609	10.06831	10.28440	42
19	9.71581	9.93161	9.78419	10.21580	10.06839	10.28419	41
20	9.71602	9.93154	9.78448	10.21552	10.06846	10.28398	40
21	9.71622	9.93146	9.78476	10.21524	10.06854	10.28378	39
22	9.71643	9.93138	9.78505	10.21495	10.06862	10.28358	38
23	9.71664	9.93131	9.78533	10.21467	10.06869	10.28336	37
24	9.71685	9.93123	9.78562	10.21438	10.06877	10.28315	36
25	9.71705	9.93115	9.78590	10.21410	10.06885	10.28295	35
26	9.71726	9.93107	9.78618	10.21382	10.06893	10.28274	34
27	9.71747	9.93100	9.78647	10.21353	10.06900	10.28253	33
28	9.71767	9.93092	9.78675	10.21325	10.06908	10.28233	32
29	9.71788	9.93084	9.78704	10.21296	10.06916	10.28212	31
30	9.71809	9.93077	9.78732	10.21268	10.06923	10.28191	30
31	9.71829	9.93069	9.78760	10.21240	10 06931	10.28171	29
32	9.71850	9.93061	9.78789	10.21211	10.06999	10.28150	28
33	9.71870	9.93053	9.78817	10.21183	10.06947	10.28130	27
34	9.71891	9.93046	9.78845	10.21155	10.06954	10.28119	26
35	9.71911	9.93038	9.78874	10.21126	10.06962	10.28089	25
36	9.71932	9 93030	9.78902	10.21098	10.06970	10.28068	24
37	9.71952	9.93022	9.78930	10.21070	10.06978	10.28048	23
38	9.71973	9.93014	9.78959	10.21041	10.06985	10.28027	22
39	9.71993	9.93007	9.78987	10.21013	10.06993	10.28007	21
40	9.72014	9.92999	9.79015	10.20985	10.07001	10.27986	20
41	9.72034	9 92991	9.79043	10.20957	10.07009	10.27965	19
42	9.72055	9.92983	9.79072	10.20928	10.07017	10.27945	18
43	9.72075	9 92975	9.79100	10.20900	10.07024	10.27925	17
44	9.72096	9.92968	9.79128	10.20872	10.07032	10.27904	16
45	9.72116	9.92960	9.79156	10.20844	10.07040	10.27884	15
46	9.72137	9.92952	9.79185	10.20815	10.07048	10.27863	14
47	9.72157	9.92944	9.79213	10.20787	10.07056	10.27843	13
48	9.72177	9.92936	9.79241	10.20759	10.07064	10.27823	12
49	9.72198	9.92929	9.79269	10.20731	10.07071	10.27802	11
50	9 72218	9.92921	9.79297	10.20703	10.07079	10.27782	10
51	9.72238	9.92913	9.79326	10.20674	10.07087	10.27761	9
52	9.72259	9.92905	9.79354	10.20646	10.07095	10.27741	8
53	9.72279	9.92897	9.79382	10.20618	10.07103	10.27721	7
54	9 72299	9.92889	9.79410	10.20590	10.07111	10.27701	6
55	9.72320	9.92881	9.79438	10.20562	10.07119	10.27680	5
56	9.72340	9 92874	9.79466	10.20534	10.07126	10.27660	4
57	9.72360	9.92866	9.79495	10.20505	10.07134	10.27640	3
58	9.72381	9.92858	9.79523	10.20477	10.07142	10.27619	2
59	9.72401	9.92850	9.79551	10.20449	10.07150	10.27599	1
60	9.72421	9.92842	9.79579	10.20421	10.07158	10.27579	0
	Co-ſine.	Sine.	Co-tang.	Tangent.	Co-ſecant	Secant.	M.

58 Degrees.

A Table of Artificial Sines, Tang. and Sec. 32 Degrees.

M.	Sine.	Co-ſine.	Tangent.	Co-tang.	Secant.	Co-ſecant	
0	9.72421	9.92842	9.79579	10.20421	10.07158	10.27579	60
1	9.72441	9.92834	9.79607	10.20393	10.07166	10.27559	59
2	9.72461	9.92826	9.79635	10.20365	10.07174	10.27539	58
3	9.72482	9.92818	9.79663	10.20337	10.07182	10.27518	57
4	9.72502	9.92810	9.79691	10.20309	10.07190	10.27498	56
5	9.72522	9.92803	9.79719	10.20281	10.07197	10.27478	55
6	9.72542	9.92795	9.79747	10.20253	10.07205	10.27458	54
7	9.72562	9.92787	9.79776	10.20224	10.07213	10.27438	53
8	9.72582	9.92779	9.79804	10.20196	10.07221	10.27418	52
9	9.72602	9.92771	9.79832	10.20168	10.07229	10.27398	51
10	9.72622	9.92763	9.79860	10.20140	10.07237	10.27378	50
11	9.72643	9.92755	9.79888	10.20112	10.07245	10.27357	49
12	9.72663	9.92747	9.79916	10.20084	10.07253	10.27337	48
13	9.72683	9.92739	9.79944	10.20056	10.07261	10.27317	47
14	9.72703	9.92731	9.79972	10.20028	10.07269	10.27297	46
15	9.72723	9.92723	9.80000	10.20000	10.07277	10.27277	45
16	9.72743	9.92715	9.80028	10.19972	10.07285	10.27257	44
17	9.72763	9.92707	9.80056	10.19944	10.07293	10.27237	43
18	9.72783	9.92699	9.80084	10.19916	10.07301	10.27217	42
19	9.72803	9.92691	9.80112	10.19888	10.07309	10.27197	41
20	9.72823	9.92683	9.80140	10.19860	10.07317	10.27177	40
21	9.72843	9.92675	9.80168	10.19832	10.07325	10.27157	39
22	9.72863	9.92667	9.80195	10.19805	10.07333	10.27137	38
23	9.72883	9.92659	9.80223	10.19777	10.07341	10.27117	37
24	9.72902	9.92651	9.80251	10.19749	10.07349	10.27098	36
25	9.72922	9.92643	9.80279	10.19721	10.07357	10.27078	35
26	9.72942	9.92635	9.80307	10.19693	10.07365	10.27058	34
27	9.72962	9.92627	9.80335	10.19665	10.07373	10.27038	33
28	9.72982	9.92619	9.80363	10.19637	10.07381	10.27018	32
29	9.73002	9.92611	9.80391	10.19609	10.07389	10.26998	31
30	9.73022	9.92603	9.80419	10.19581	10.07397	10.26978	30
31	9.73041	9.92595	9.80447	10.19553	10.07405	10.26959	29
32	9.73061	9.92587	9.80474	10.19526	10.07413	10.26939	28
33	9.73081	9.92579	9.80502	10.19498	10.07421	10.26919	27
34	9.73101	9.92571	9.80530	10.19470	10.07429	10.26899	26
35	9.73121	9.92563	9.80558	10.19442	10.07437	10.26879	25
36	9.73140	9.92556	9.80585	10.19414	10.07445	10.26860	24
37	9.73160	9.92546	9.80614	10.19386	10.07454	10.26840	23
38	9.73180	9.92538	9.80642	10.19358	10.07462	10.26820	22
39	9.73200	9.92530	9.80669	10.19331	10.07470	10.26800	21
40	9.73219	9.92522	9.80697	10.19303	10.07478	10.26781	20
41	9.73239	9.92514	9.80725	10.19275	10.07486	10.26761	19
42	9.73259	9.92506	9.80753	10.19247	10.07494	10.26741	18
43	9.73278	9.92498	9.80781	10.19219	10.07502	10.26722	17
44	9.73298	9.92490	9.80808	10.19192	10.07510	10.26702	16
45	9.73318	9.92482	9.80836	10.19164	10.07518	10.26682	15
46	9.73337	9.92473	9.80864	10.19136	10.07527	10.26663	14
47	9.73357	9.92465	9.80892	10.19108	10.07535	10.26643	13
48	9.73377	9.92457	9.80919	10.19081	10.07543	10.26623	12
49	9.73396	9.92449	9.80947	10.19053	10.07551	10.26604	11
50	9.73416	9.92441	9.80975	10.19025	10.07559	10.26584	10
51	9.73435	9.92433	9.81003	10.18997	10.07567	10.26565	9
52	9.73455	9.92425	9.81030	10.18970	10.07575	10.26545	8
53	9.73474	9.92416	9.81058	10.18942	10.07584	20.26526	7
54	9.73494	9.92408	9.81086	10.18914	10.07592	10.26506	6
55	9.73513	9.92400	9.81113	10.18887	10.07600	10.26487	5
56	9.73533	9.92392	9.81141	10.18859	10.07608	10.26467	4
57	9.73552	9.92384	9.81169	10.18831	10.07616	10.26448	3
58	9.73572	9.92376	9.81196	10.18804	10.07624	10.26428	2
59	9.73591	9.92367	9.81324	10.18776	10.07633	10.26409	1
60	9.73611	9.92359	9.81225	10.18748	10.07641	10.26389	0
	Co-ſine.	Sine.	Co-tang.	Tangent.	Co-ſecan	Secant.	M.

57 Degrees.

A Table of Artificial Sines, Tang. and Sec. 33 Degrees.

M.	Sine.	Co-ſine.	Tangent.	Co-tang.	Secant.	Co-ſecant	
0	9.73611	9.92359	9.81252	10.18748	10.07641	10.26389	60
1	9.73630	9.92351	9.81279	10.18721	10.07649	10.26370	59
2	9.73650	9.92343	9.81307	10.18693	10.07657	10.26350	58
3	9.73669	9.92334	9.81335	10.18665	10.07666	10.26331	57
4	9.73688	9.92326	9.81362	10.18638	10.07674	10.26311	56
5	9.73709	9.92318	9.81390	10.18610	10.07682	10.26292	55
6	9.73727	9.92310	9.81417	10.18582	10.07690	10.26273	54
7	9.73747	9.92302	9.81445	10.18555	10.07698	10.26253	53
8	9.73766	9.92293	9.81473	10.18527	10.07707	10.26234	52
9	9.73785	9.92285	9.81500	10.18500	10.07715	10.26215	51
10	9.73805	9.92277	9.81528	10.18472	10.07723	10.26195	50
11	9.73824	9.92269	9.81556	10.18444	10.07731	10.26176	49
12	9.73843	9.92260	9.81583	10.18417	10.07740	10.26157	48
13	9.73863	9.92252	9.81611	10.18389	10.07748	10.26137	47
14	9.73882	9.92244	9.81638	10.18362	10.07756	10.26118	46
15	9.73901	9.92235	9.81666	10.18334	10.07765	10.26099	45
16	9.73921	9.92227	9.81693	10.18307	10.07773	10.26079	44
17	9.73940	9.92219	9.81721	10.18279	10.07781	10.26060	43
18	9.73959	9.92211	9.81748	10.18252	10.07789	10.26041	42
19	9.73978	9.92202	9.81776	10.18224	10.07798	10.26022	41
20	9.73997	9.92194	9.81803	10.18197	10.07806	10.26002	40
21	9.74017	9.92186	9.81831	10.18169	10.07814	10.25983	39
22	9.74036	9.92177	9.81858	10.18142	10.07823	10.25964	38
23	9.74055	9.92169	9.81886	10.18114	10.07831	10.25945	37
24	9.74074	9.92161	9.81913	10.18087	10.07839	10.25926	36
25	9.74093	9.92152	9.81941	10.18059	10.07848	10.25907	35
26	9.74112	9.92144	9.81968	10.18032	10.07856	10.25887	34
27	9.74132	9.92136	9.81996	10.18004	10.07864	10.25868	33
28	9.74151	9.92127	9.82023	10.17977	10.07873	10.25849	32
29	9.74170	9.92119	9.82051	10.17949	10.07881	10.25830	31
30	9.74189	9.92111	9.82078	10.17922	10.07889	10.25811	30
31	9.74208	9.92102	9.82106	10.17894	10.07898	10.25792	29
32	9.74227	9.92094	9.82133	10.17867	10.07906	10.25773	28
33	9.74246	9.92086	9.82161	10.17839	10.07914	10.25754	27
34	9.74265	9.92077	9.82188	10.17812	10.07923	10.25735	26
35	9.74284	9.92069	9.82215	10.17784	10.07931	10.25716	25
36	9.74303	9.92060	9.82243	10.17757	10.07940	10.25697	24
37	9.74322	9.92052	9.82270	10.17730	10.07948	10.25678	23
38	9.74341	9.92044	9.82298	10. 7702	10.07956	10.25659	22
39	9.74360	9.92035	9.82325	10.17675	10.07965	10.25640	21
40	9.74379	9.92027	9.82352	10.17648	10.07973	10.25621	20
41	9.74398	9.92018	9.82380	10.17620	10.07982	10.25602	19
42	9.74417	9.92010	9.82407	10.17593	10.07990	10.25583	18
43	9.74436	9.92002	9.82434	10.17565	10.07998	10.25564	17
44	9.74455	9.91993	9.82462	10.17538	10.08007	10.25545	16
45	9.74474	9.91985	9.82489	10.17511	10.08015	10.25526	15
46	9.74493	9.91976	9.82537	10.17483	10.08024	10.25507	14
47	9.74512	9.91968	9.82544	10.17456	10.08032	10.25488	13
48	9.74532	9.91959	9.82571	10.17429	10.08041	10.25469	12
49	9.74549	9.91951	9.82599	10.17401	10.08049	10.25451	11
50	9.74568	9.91942	9.82626	10.17374	10.08058	10.25432	10
51	9.74587	9.91934	9.82653	10.17347	10.08066	10.25413	9
52	9.74606	9.91925	9.82681	10.17319	10.08075	10.25394	8
53	9.74625	9.91917	9.82708	10.17292	10.08083	10.25375	7
54	9.74644	9.91908	9.82735	10.17265	10.08092	10.25356	6
55	9.74662	9.91900	9.82762	10.17238	10.08100	10.25338	5
56	9.74681	9.91891	9.82790	10.17210	10.08109	10.25319	4
57	9.74700	9.91883	9.82817	10.17183	10.08117	10.25300	3
58	9.74719	9.91874	9.82844	10.17156	10.08126	10.25281	2
59	9.74737	9.91866	9.82871	10.17129	10.08134	10.25263	1
60	9.74756	9.91857	9.82899	10.17101	10.08143	10.25244	0
	Co-ſine.	Sine.	Co-tang.	Tangent.	Co-ſecant	Secant.	M.

56 Degrees.

A Table of Artificial Sines, Tang. and Sec. 34 Degrees.

M	Sine.	Co-ſine.	Tangent.	Co-tang.	Secant.	Co-ſecant	
0	9.74756	9.91857	9.82899	10.17101	10.08143	10.25244	60
1	9.74775	9.91849	9.82926	10.17074	10.08151	10.25225	59
2	9.74794	9.91840	9.82953	10.17047	10.08160	10.25206	58
3	9.74812	9.91832	9.82980	10.17020	10,08168	10.25188	57
4	9.74831	9.91823	9.83008	10.16992	10.08177	10.25169	56
5	9.74850	9.91815	9.83035	10.16965	10.08185	10.25150	55
6	9,74868	9.91806	9.83062	10.16938	10.08194	10.25132	54
7	9.74887	9.91798	9.83089	10.16911	10.08202	10.25113	53
8	9.74906	9.91789	9.83116	10.16883	10.08211	10.25094	52
9	9.74924	9.91780	9.83144	10.16856	10.08219	10.25076	51
10	9.74943	9 91772	9.83171	10.16829	10.08228	10.25057	50
11	9.74961	9.91763	9.83198	10.16802	10.08237	10.25039	49
12	9.74980	9,91755	9.83225	10.16775	10.08245	10.25020	48
13	9.74999	9.91746	9.83252	10.16748	10.08254	10.25001	47
14	9.75017	9.91738	9.83279	10.16720	10.08262	10.24983	46
15	9.75036	9.91729	9.83307	10.16693	10.08271	10.24964	45
16	9.75054	9.91720	9.83334	10.16666	10.08280	10.24946	44
17	9.75073	9.91712	9.83361	10.16639	10.08288	10.24927	43
18	9.75091	9.91703	9.83388	10.16612	10.08297	10.24909	42
19	9.75110	9.91694	9.83415	10.16585	10.08305	10.24890	41
20	9.75128	9.91686	9.83442	10.16558	10.08314	10.24872	40
21	9.75147	9.91677	9.83470	10.16530	10.08323	10.24853	39
22	9.75165	9 91668	9.83497	10.16503	10.08331	10.24835	38
23	9.75184	9.91660	9.83524	10.16476	10.08340	10.24816	37
24	9.75202	9.91651	9.83551	10.16449	10.08349	10.24798	36
25	9.75221	9.91643	9.83578	10.16422	10.08357	10.24779	35
26	9.75239	9.91634	9.83605	10.16395	10.08366	10.24761	34
27	9.75258	9.91625	9.83632	10.16368	10.08375	10.24742	33
28	9.75276	9 91617	9.83659	10.16341	10.08383	10.24724	32
29	9.75294	9.91608	9.83686	10.16314	10.08392	10.24706	31
30	9.75313	9.91599	9.83713	10.16287	10.08401	10.24687	30
31	9.75331	9.91591	9.83740	10.16260	10.08409	10.24669	29
32	9.75349	9.91582	9.83767	10.16232	10.08418	10.24650	28
33	9.75368	9.91573	9.83795	10.16205	10.08427	10.24632	27
34	9.75386	9.91565	9.83822	10.16178	10.08435	10.24614	26
35	9.75405	9.91556	9.83840	10.16151	10.08444	10.24595	25
36	9.75423	9.91547	9.83876	10.16124	10.08453	10.24577	24
37	9.75441	9.91538	9.83903	10.16097	10.08462	10.24559	23
38	9.75459	9.91530	9.83930	10.16070	10.08470	10.24541	22
39	9.75478	9.91521	9.83957	10.16043	10.08479	10.24522	21
40	9.75496	9.91512	9.83984	10.16016	10.08488	10.24504	20
41	9.75514	9.91503	9.84011	10.15989	10.08496	10.24486	19
42	9.75533	9.91495	9.84038	10.15962	10.08505	10.24467	18
43	9.75551	9 91486	9.84065	10.15935	10.08514	10.24449	17
44	9.75569	9.91477	9.84092	10.15908	10.08523	10.24431	16
45	9.75587	9.91468	9.84119	10.18881	10.08531	10.24413	15
46	9.75605	9.91460	9.84146	10.15854	10.08540	10.24395	14
47	9.75624	9.91451	9.84173	10.15827	10.08549	10.24376	13
48	9.75642	9.91442	9.84200	10.15800	10.08558	10.24358	12
49	9.75660	9.91433	9.84227	10.15773	10.08567	10.24340	11
50	9 75678	9.91425	9.84254	10.15746	10.08575	10.24322	10
51	9.75696	9.91416	9.84280	10.15720	10.08584	10.24304	9
52	9.75714	9.91407	9.84307	10.15693	10.08593	10.24286	8
53	9.75732	9.91398	9.84334	10.15666	10.08602	10.24267	7
54	9 75751	9.91389	9.84361	10.15639	10.08611	10.24249	6
55	9.75769	9.91381	9.84388	10.15612	10.08619	10.24231	5
56	9.75787	9 91372	9.84415	10.15585	10.08628	10.24213	4
57	9.75805	9.91363	9.84442	10.15558	10.08637	10.24195	3
58	9.75823	9.91354	9.84469	10.15531	10.08646	10.24177	2
59	9.75841	9.91345	9.84496	10.15504	10.08655	10.24159	1
60	9.75859	9.91336	9.84423	10.15477	10.08664	10.24141	0
	Co ſine.	Sine.	Co-tang.	Tangent.	Co-ſecant	Secant.	M.

55 Degrees.

A Table of Artificial Sines, Tang. and Sec. 35 Degrees,

M.	Sine.	Co-ſine.	Tangent.	Co-tang.	Secant.	Co-ſecant	
0	9.75859	9.91336	9.84523	10.15477	10.08664	10.24141	60
1	9.75877	9.91328	9.84550	10.15450	10.08672	10.24123	59
2	9.75895	9.91319	9.84576	10.15424	10.08681	10.24105	58
3	9.75913	9.91310	9.84603	10.15397	10.08690	10.24087	57
4	9.75931	9.91301	9.84630	10.15370	10.08699	10.24069	56
5	9.75949	9.91292	9.84657	10.15343	10.08708	10.24051	55
6	9.75967	9.91283	9.84684	10.15316	10.08717	10.24033	54
7	9.75985	9.91274	9.84711	10.15289	10.08726	10.24015	53
8	9.76003	9.91267	9.84738	10.15262	10.08734	10.23997	52
9	9.76021	9.91257	9.84764	10.15236	10.08743	10.23979	51
10	9.76039	9.91248	9.84791	10.15209	10.08752	10.23961	50
11	9.76057	9.91239	9.84818	10.15182	10.08761	10.23943	49
12	9.76075	9.91230	9.84845	10.15155	10.08770	10.23925	48
13	9.76093	9.91221	9.84872	10.15128	10.08779	10.23907	47
14	9.76111	9.91212	9.84899	10.15101	10.08788	10.23889	46
15	9.76129	9.91203	9.84925	10.15075	10.08797	10.23871	45
16	9.76146	9.91194	9.84952	10.15048	10.08806	10.23854	44
17	9.76164	9.91185	9.84979	10.15021	10.08815	10.23836	43
18	9.76182	9.91176	9.85006	10.14994	10.08824	10.23818	42
19	9.76200	9.91167	9.85033	10.14967	10.08833	10.23800	41
20	9.76218	9.91158	9.85059	10.14941	10.08842	10.23782	40
21	9.76236	9.91149	9.85086	10.14914	10.08851	10.23764	39
22	9.76253	9.91141	9.85113	10.14887	10.08859	10.23747	38
23	9.76271	9.91132	9.85140	10.14860	10.08868	10.23729	37
24	9.76289	9.91123	9.85166	10.14834	10.08877	10.23711	36
25	9.76307	9.91114	9.85193	10.14807	10.08886	10.23693	35
26	9.76324	9.91105	9.85220	10.14780	10.08895	10.23676	34
27	9.76342	9.91096	9.85247	10.14753	10.08904	10.23658	33
28	9.76360	9.91087	9.85273	10.14727	10.08913	10.23640	32
29	9.76378	9.91078	9.85300	10.14700	10.08922	10.23622	31
30	9.76395	9.91069	9.85327	10.14673	10.08931	10.23605	30
31	9.76413	9.91060	9.85354	10.14646	10.08940	10.23587	29
32	9.76431	9.91051	9.85380	10.14620	10.08949	10.23569	28
33	9.76448	9.91042	9.85407	10.14593	10.08958	10.23552	27
34	9.76466	9.91034	9.85434	10.14566	10.08966	10.23534	26
35	9.76484	9.91023	9.85460	10.14540	10.08977	10.23516	25
36	9.76501	9.91014	9.85487	10.14513	10.08987	10.23499	24
37	9.76519	9.91005	9.85514	10.14486	10.08995	10.23481	23
38	9.76537	9.90996	9.85540	10.14460	10.09004	10.23463	22
39	9.76554	9.90987	9.85567	10.14433	10.09013	10.23446	21
40	9.76572	9.90978	9.85594	10.14406	10.09022	10.23428	20
41	9.76590	9.90969	9.85620	10.14380	10.09031	10.23410	19
42	9.76607	9.90960	9.85647	10.14353	10.09040	10.23393	18
43	9.76625	9.90951	9.85674	10.14326	10.09049	10.23375	17
44	9.76642	9.90942	9.85700	10.14300	10.09058	10.23358	16
45	9.76660	9.90933	9.85727	10.14273	10.09067	10.23340	15
46	9.76677	9.90924	9.85754	10.14246	10.09076	10.23323	14
47	9.76695	9.90915	9.85780	10.14220	10.09085	10.23305	13
48	9.76762	9.90905	9.85807	10.14193	10.09095	10.23288	12
49	9.76730	9.90896	9.85834	10.14166	10.09104	10.23270	11
50	9.76747	9.90887	9.85860	10.14140	10.09113	10.23253	10
51	9.76765	9.90878	9.85887	10.14113	10.09122	10.23235	9
52	9.76782	9.90869	9.85913	10.14087	10.09131	10.23218	8
53	9.76800	9.90860	9.85940	10.14060	10.09140	10.23200	7
54	9.76817	9.90851	9.85967	10.14033	10.09149	10.23183	6
55	9.76835	9.90842	9.85993	10.14007	10.09158	10.23165	5
56	9.76852	9.90832	9.86020	10.13980	10.09168	10.23148	4
57	9.76870	9.90823	9.86046	10.13954	10.09177	10.23130	3
58	9.76887	9.90814	9.86073	10.13927	10.09186	10.23113	2
59	9.76904	9.90805	9.86100	10.13900	10.09195	10.23096	1
60	9.76922	9.90796	9.86126	10.13874	10.09204	10.23078	0
	Co-ſine.	Sine.	Co-tang.	Tangent.	Co-ſecant	Secant.	M.

54 Degrees.

A Table of Artificial Sines, Tang. and Sec. 36 Degrees.

M.	Sine.	Co-ſine.	Tangent.	Co-tang.	Secant.	Co-ſecant	
0	9.77922	9.90796	9.86126	10.13874	10.09204	10.23078	60
1	9.77939	9.90787	9.86153	10.13847	10.09213	10.23061	59
2	9.77957	9.90777	9.86179	10.13821	10.09223	10.23043	58
3	9.77974	9.90768	9.86206	10.13794	10.09232	10.23026	57
4	9.77991	9.90759	9.86232	10.13768	10.09241	10.23009	56
5	9.77009	9.90750	9.86259	10.13741	10.09250	10.22991	55
6	9.77026	9.90741	9.86285	10.13715	10.09259	10.22974	54
7	9.77043	9.90731	9.86312	10.13688	10.09269	10.22957	53
8	9.77061	9.90722	9.86338	10.13662	10.09278	10.22939	52
9	9.77078	9.90713	9.86365	10.13635	10.09287	10.22922	51
10	9.77095	9.90704	9.86392	10.13608	10.09296	10.22905	50
11	9.77112	9.90694	9.86418	10.13582	10.09306	10.22888	49
12	9.77130	9.90685	9.86445	10.13555	10.09315	10.22870	48
13	9.77147	9.90676	9.86471	10.13529	10.09324	10.22853	47
14	9.77164	9.90667	9.86496	10.13502	10.09333	10.22836	46
15	9.77181	9.90657	9.86524	10.13476	10.09343	10.22819	45
16	9.77199	9.90648	9.86559	10.13449	10.09352	10.22801	44
17	9.77216	9.90639	9.86577	10.13423	10.09361	10.22784	43
18	9.77233	9.90630	9.86603	10.13397	10.09370	10.22767	42
19	9.77250	9.90620	9.86630	10.13370	10.09380	10.22750	41
20	9.77268	9.90611	9.86656	10.13344	10.09389	10.22732	40
21	9.77285	9.90602	9.86683	10.13317	10.09398	10.22715	39
22	9.77302	9.90592	9.86709	10.13291	10.09406	10.22698	38
23	9.77319	9.90583	9.86736	10.13264	10.09417	10.22681	37
24	9.77336	9.90574	9.86762	10.13238	10.09426	10.22664	36
25	9.77353	9.90565	9.86789	10.13211	10.09435	10.22647	35
26	9.77370	9.90555	9.86815	10.13185	10.09445	10.22630	34
27	9.77387	9.90546	9.86842	10.13158	10.09454	10.22613	33
28	9.77405	9.90537	9.86868	10.13132	10.09463	10.22595	32
29	9.77422	9.90527	9.86894	10.13106	10.09473	10.22578	31
30	9.77439	9.90518	9.86921	10.13079	10.09472	10.22561	30
31	9.77456	9.90509	9.86947	10.13053	10.09491	10.22544	29
32	9.77473	9.90499	9.86974	10.13026	10.09501	10.22527	28
33	9.77490	9.90490	9.87000	10.13000	10.09510	10.22510	27
34	9.77507	9.90480	9.87027	10.12973	10.09520	10.22493	26
35	9.77524	9.90471	9.87053	10.12947	10.09529	10.22476	25
36	9.77541	9.90462	9.87079	10.12921	10.09538	10.22459	24
37	9.77558	9.90453	9.87106	10.12894	10.09548	10.22442	23
38	9.77575	9.90443	9.87132	10.12868	10.09557	10.22425	22
39	9.77592	9.90434	9.87158	10.12842	10.09566	10.22408	21
40	9.77609	9.90424	9.87185	10.12815	10.09576	10.22391	20
41	9.77626	9.90415	9.87211	10.12789	10.09585	10.22374	19
42	9.77643	9.90405	9.87238	10.12762	10.09595	10.22357	18
43	9.77660	9.90396	9.87264	10.12736	10.09604	10.22340	17
44	9.77677	9.90386	9.87290	10.12710	10.09613	10.22324	16
45	9.77694	9.90377	9.87317	10.12683	10.09623	10.22306	15
46	9.77711	9.90368	9.87343	10.12657	10.09632	10.22289	14
47	9.77727	9.90358	9.87369	10.12631	10.09642	10.22272	13
48	9.77744	9.90349	9.87396	10.12604	10.09651	10.22256	12
49	9.77761	9.90339	9.87322	10.12578	10.09561	10.22239	11
50	9.77778	9.90330	9.87448	10.12552	10.09670	10.22222	10
51	9.77795	9.90320	9.87475	10.12525	10.09680	10.22205	9
52	9.77812	9.90311	9.87501	10.12499	10.09689	10.22188	8
53	9.77829	9.90301	9.87527	10.12473	10.09699	10.22171	7
54	9.77846	9.90292	9.87554	10.12446	10.09708	10.22154	6
55	9.47862	9.90282	9.87580	10.12420	10.09718	10.22138	5
56	9.77879	9.90273	9.87606	10.12394	10.09727	10.22121	4
57	9.77896	9.90263	9.87633	10.12367	10.09737	10.22004	3
58	9.77913	9.90254	9.87659	10.12341	10.09746	10.22087	2
59	9.77930	9.90244	9.87685	10.12315	10.09756	10.22070	1
60	9.77946	9.90235	9.87711	10.12289	10.09765	10.22054	0
	Co-ſine.	Sine.	Co-tang.	Tangent.	Co-ſecant	Secant.	M.

53 Degrees.

A Table of Artificial Sines, Tang. and Sec. 37 Degrees.

M.	Sine.	Co-Sine.	Tangent.	Co-tang.	Secant.	Co-ſecant	
0	9.77946	9.90235	9.87711	10.12289	10.09765	10.22054	60
1	9.77963	9.90225	9.87738	10.12262	10.09775	10.22037	59
2	9.77980	9.90216	9.87764	10.12236	10.09784	10.22020	58
3	9.77997	9.90206	9.87790	10.12210	10.09794	10.22003	57
4	9.78013	9.90197	9.87817	10.12183	10.09803	10.21987	56
5	9.78030	9.90187	9.87843	10.12157	10.09813	10.21970	55
6	9.78047	9.90178	9.87869	10.12131	10.09822	10.21953	54
7	9.78063	9.90168	9.87895	10.12105	10.09832	10.21937	53
8	9.78080	9.90159	9.87922	10.12078	10.09841	10.21920	52
9	9.78097	9.90149	9.87948	10.12052	10.09851	10.21903	51
10	9.78113	9.90139	9.87974	10.12026	10.09861	10.21887	50
11	9.78130	9.90130	9.88000	10.12000	10.09870	10.21870	49
12	9.78147	9.90120	9.88027	10.11973	10.09880	10.21853	48
13	9.78163	9.90111	9.88053	10.11947	10.09889	10.21837	47
14	9.78180	9.90101	9.88079	10.11921	10.09899	10.21820	46
15	9.78197	9.90091	9.88105	10.11895	10.09909	10.21803	45
16	9.78213	9.90082	9.88131	10.11869	10.09918	10.21787	44
17	9.78230	9.90072	9.88158	10.11842	10.09928	10.21770	43
18	9.78246	9.90063	9.88184	10.11816	10.09937	10.21754	42
19	9.78263	9.90053	9.88210	10.11790	10.09947	10.21737	41
20	9.78280	9.90043	9.88236	10.11764	10.09957	10.21720	40
21	9.78296	9.90034	9.88262	10.11738	10.09966	10.21704	39
22	9.78313	9.90024	9.88289	10.11711	10.09976	10.21687	38
23	9.78329	9.90014	9.88315	10.11685	10.09986	10.21671	37
24	9.78346	9.90005	9.88341	10.11659	10.09995	10.21654	36
25	9.78362	9.89995	9.88367	10.11633	10.10005	10.21638	35
26	9.78379	9.89985	9.88393	10.11607	10.10015	10.21621	34
27	9.78395	9.89976	9.88420	10.11580	10.10024	10.21605	33
28	9.78412	9.89966	9.88446	10.11554	10.10034	10.21588	32
29	9.78428	9.89956	9.88472	10.11528	10.10044	10.21572	31
30	9.78445	9.89947	9.88498	10.11502	10.10053	10.21555	30
31	9.78461	9.89937	9.88524	10.11476	10.10063	10.21539	29
32	9.78478	9.89927	9.88550	10.11450	10.10073	10.21522	28
33	9.78494	9.89918	9.88576	10.11424	10.10082	10.21506	27
34	9.78510	9.89908	9.88603	10.11397	10.10092	10.21490	26
35	9.78527	9.89898	9.88629	10.11371	10.10102	10.21473	25
36	9.78543	9.89888	9.88655	10.11345	10.10112	10.21457	24
37	9.78560	9.89879	9.88681	10.11319	10.10121	10.21440	23
38	9.78576	9.89869	9.88707	10.11293	10.10131	10.21424	22
39	9.78592	9.89859	9.88733	10.11267	10.10141	10.21408	21
40	9.78609	9.89849	9.88759	10.11241	10.10151	10.21391	20
41	9.78625	9.89840	9.88786	10.11214	10.10160	10.21375	19
42	9.78642	9.89830	9.88812	10.11188	10.10170	10.21358	18
43	9.78658	9.89820	9.88838	10.11162	10.10180	10.21342	17
44	9.78674	9.89810	9.88864	10.11136	10.10190	10.21326	16
45	9.78691	9.89801	9.88890	10.11110	10.10199	10.21309	15
46	9.78707	9.89791	9.88916	10.11084	10.10209	10.21293	14
47	9.78723	9.89781	9.88942	10.11058	10.10219	10.21277	13
48	9.78739	9.89771	9.88968	10.11032	10.10229	10.21261	12
49	9.78756	9.89761	9.88994	10.11006	10.10239	10.21244	11
50	9.78772	9.89752	9.89020	10.10980	10.10248	10.21228	10
51	9.78788	9.89742	9.89046	10.10954	10.10258	10.21212	9
52	9.78805	9.89732	9.89073	10.10927	10.10268	10.21195	8
53	9.78821	9.89722	9.89099	10.10901	10.10278	10.21179	7
54	9.78837	9.89712	9.89125	10.10875	10.10288	10.21163	6
55	9.78853	9.89702	9.89151	10.10849	10.10298	10.21147	5
56	9.78869	9.89693	9.89172	10.10823	10.10307	10.21131	4
57	9.78886	9.89683	9.89203	10.10797	10.10317	10.21114	3
58	9.78902	9.89673	9.89229	10.10771	10.10327	10.21098	2
59	9.78918	9.89663	9.89255	10.10745	10.10337	10.21082	1
60	9.78934	9.89653	9.89281	10.10719	10.10347	10.21066	0
	Co-ſine.	Sine.	Co tang.	Tangent.	Co-ſecant	Secant.	M.

52 Degrees.

A Table of Artificial Sines, Tang. and Sec. 38 Degrees.

M.	Sine.	Co-ſine.	Tangent.	Co-tang.	Secant.	Co-ſecant	
0	9.78934	9.89653	9.89281	10.10719	10.10347	10.21066	60
1	9.78950	9.89643	9.89307	10.10693	10.10357	10.21050	59
2	9.78967	9.89633	9.89333	10.10667	10.10367	10.21033	58
3	9.78983	9.89624	9.89359	10.10641	10.10376	10.21017	57
4	9.78999	9.89614	9.89385	10.10615	10.10386	10.21001	56
5	9.79015	9.89604	9.89411	10.10589	10.10396	10.20985	55
6	9.79031	9.89594	9.89437	10.10563	10.10406	10.20969	54
7	9.79047	9.89584	9.89463	10.10537	10.10416	10.20953	53
8	9.79063	9.89574	9.89489	10.10511	10.10426	10.20937	52
9	9.79079	9.89564	9.89515	10.10485	10.10436	10.20921	51
10	9.79095	9.89554	9.89541	10.10459	10.10446	10.20905	50
11	9.79111	9.89544	9.89567	10.10433	10.10456	10.20889	49
12	9.79128	9.89534	9.89593	10.10407	10.10466	10.20872	48
13	9.79144	9.89524	9.89619	10.10381	10.10476	10.20856	47
14	9.79160	9.89514	9.89645	10.10355	10.10486	10.20840	46
15	9.79176	9.89504	9.89671	10.10329	10.10496	10.20824	45
16	9.79192	9.89495	9.89697	10.10303	10.10505	10.20808	44
17	9.79208	9.89485	9.89723	10.10277	10.10515	10.20792	43
18	9.79224	9.89475	9.89749	10.10251	10.10525	10.20776	42
19	9.79240	9.89465	9.89775	10.10225	10.10535	10.20760	41
20	9.79256	9.89455	9.89801	10.10199	10.10545	10.20744	40
21	9.79272	9.89445	9.89827	10.10173	10.10555	10.20728	39
22	9.79288	9.89435	9.89853	10.10147	10.10565	10.20712	38
23	9.79304	9.89425	9.89879	10.10121	10.10575	10.20696	37
24	9.79319	9.89415	9.89905	10.10095	10.10585	10.20681	36
25	9.79335	9.89405	9.89931	10.10069	10.10595	10.20665	35
26	9.79351	9.89395	9.89957	10.10043	10.10605	10.20649	34
27	9.79367	9.89385	9.89983	10.10017	10.10615	10.20633	33
28	9.79383	9.89375	9.90009	10.09991	10.10625	10.20617	32
29	9.79399	9.89364	9.90035	10.09955	10.10636	10.20601	31
30	9.79415	9.89354	9.90060	10.09939	10.10646	10.20585	30
31	9.79431	9.89344	9.90086	10.09914	10.10656	10.20569	29
32	9.79447	9.89334	9.90112	10.09888	10.10666	10.20553	28
33	9.79463	9.89324	9.90138	10.09862	10.10676	10.20537	27
34	9.79478	9.89314	9.90164	10.09836	10.10686	10.20522	26
35	9.79494	9.89304	9.90190	10.09810	10.10696	10.20506	25
36	9.79510	9.89294	9.90216	10.09784	10.10706	10.20490	24
37	9.79526	9.89284	9.90242	10.09758	10.10716	10.20574	23
38	9.79542	9.89274	9.90268	10.09732	10.10726	10.20458	22
39	9.79558	9.89264	9.90294	10.09706	10.10736	10.20442	21
40	9.79573	9.89254	9.90320	10.09680	10.10746	10.20427	20
41	9.79589	9.89244	9.90346	10.09654	10.10756	10.20411	19
42	9.79605	9.89233	9.90371	10.09629	10.10767	10.20395	18
43	9.79621	9.89223	9.90397	10.09603	10.10777	10.20379	17
44	9.79636	9.89213	9.90423	10.09577	10.10787	10.20364	16
45	9.79652	9.89203	9.90449	10.09551	10.10797	10.20348	15
46	9.79668	9.89193	9.90475	10.09525	10.10807	10.20332	14
47	9.79684	9.89183	9.90501	10.09499	10.10814	10.20316	13
48	9.79699	9.89173	9.90527	10.09473	10.10827	10.20301	12
49	9.79715	9.89162	9.90553	10.09447	10.10838	10.20285	11
50	9.79731	9.89152	9.90578	10.09422	10.10848	10.20269	10
51	9.79746	9.89142	9.90604	10.09396	10.10858	10.20254	9
52	9.79762	9.89132	9.90630	10.09370	10.10868	10.20238	8
53	9.79778	9.89122	9.90656	10.09344	10.10878	10.20222	7
54	9.79793	9.89112	9.90682	10.09318	10.10888	10.20207	6
55	9.79809	9.89101	9.90708	10.09292	10.10899	10.20191	5
56	9.79825	9.89091	9.90734	10.09266	10.10909	10.20175	4
57	9.79840	9.89081	9.90759	10.09241	10.10919	10.20160	3
58	9.79856	9.89071	9.90785	10.09215	10.10929	10.20144	2
59	9.79872	9.89060	9.90811	10.09189	10.10940	10.20128	1
60	9.79887	9.89050	9.90837	10.09163	10.10950	10.20113	0
	Co-ſine.	Sine.	Co-tang.	Tangent.	Co-ſecant	Secant.	M.

51 Degrees.

A Table of Artificial Sines, Tang. and Sec. 39 Degrees.

M.	Sine.	Co-ſine.	Tangent.	Co-tang.	Secant.	Co-ſecant	
0	9.79887	9.89050	9.90837	10.09163	10.10950	10.20113	60
1	9.79903	9.89040	9.90863	10.09137	10.10960	10.20097	59
2	9.79918	9.89030	9.90889	10.09111	10.10970	10.20082	58
3	9.79934	9.89020	9.90914	10.09086	10.10980	10.20066	57
4	9.79950	9.89009	9.90940	10.09060	10.10991	10.20050	56
5	9.79965	9.88999	9.90966	10.09034	10.11001	10.20035	55
6	9.79981	9.88989	9.90992	10.09008	10.11011	10.20019	54
7	9.79996	9.88978	9.91018	10.08982	10.11022	10.20004	53
8	9.80012	9.88968	9.91043	10.08957	10.11032	10.19988	52
9	9.80027	9.88958	9.91069	10.08931	10.11042	10.19973	51
10	9.80043	9.88948	9.91095	10.08905	10.11952	10.19957	50
11	9.80058	9.88937	9.91121	10.08879	10.11063	10.19942	49
12	9 80074	9.88927	9.91147	10.08853	10.11073	10.19926	48
13	9.80089	9.88917	9.91172	10.08828	10.11083	10.19911	47
14	9.80105	9.88906	9.91198	10.08802	10.11094	10.19895	46
15	9.80120	9.88896	9.91224	10.08776	10.11104	10.19880	45
16	9.80136	9.88886	9.91250	10.08750	10.11114	10.19864	44
17	9.80151	9.88875	9.91276	10.08724	10.11125	10.19849	43
18	9.80166	9.88865	9.91301	10.08699	10.11135	10.19834	42
19	9 80182	9.88855	9.91327	10.08673	10.11145	10.19818	41
20	9.80197	9.88844	9.91353	10.08647	10.11156	10.19803	40
21	9.80213	9.88834	9.91379	10.08621	10.11166	10.19787	39
22	9.80228	9.88824	9.91404	10.08596	10.11176	10.19772	38
23	9.80244	9.88813	9.91430	10.08570	10.11187	10.19756	37
24	9.80259	9.88803	9.91456	10.08544	10.11197	10.19741	36
25	9.80274	9.88793	9.91482	10.08518	10.11207	10.19726	35
26	9.80290	9.88782	9.91507	10.08493	10.11218	10.19710	34
27	9.80305	9.88772	9.91533	10.08467	10.11228	10.19695	33
28	9.80320	9.88761	9.91559	10.08441	10.11239	10.19680	32
29	9.80336	9.88751	9.91585	10.08415	10.11249	10.19664	31
30	9.80351	9.88741	9.91610	10.08390	10.11259	10.19649	30
31	9.80366	9.88730	9.91636	10.08364	10.11270	10.19634	29
32	9.80382	9.88720	9.91662	10.08338	10.11280	10.19618	28
33	9.80397	9.88709	9.91688	10.08312	10.11291	10.19603	27
34	9 80412	9.88699	9.91713	10.08287	10.11301	10.19588	26
35	9.80428	9.88688	9.91739	10.08261	10.11312	10.19572	25
36	9.80443	9.88678	9.91765	10.08235	10.11322	10.19557	24
37	9.80458	9.88668	9.91791	10.08209	10.11332	10.19542	23
38	9.80473	9.88657	9.91816	10.08184	10.11343	10.19527	22
39	9.80489	9.88647	9.91842	10.08158	10.11353	10.19511	21
40	9.80504	9.88636	9.91868	10.08132	10.11364	10.19496	20
41	9.80519	9.88626	9.91893	10.08107	10.11374	10.19481	19
42	9 80534	9.88615	9.91919	10.08081	10.11385	10.19466	18
43	9.80550	9.88605	9.91945	10.08055	10.11395	10.19450	17
44	9.80565	9.88594	9.91971	10.08029	10.11406	10.19435	16
45	9.80580	9.88584	9.91996	10.08004	10.11416	10.19420	15
46	9.80595	9.88573	9.92022	10.07978	10.11427	10.19405	14
47	9.80610	9.88563	9.92048	10.07952	10.11437	10.19390	13
48	9.80625	9.88552	9.92073	10.07927	10.11448	10.19375	12
49	9.80641	9.88542	9.92099	10.07901	10.11458	10.19359	11
50	9.80656	9.88531	9.92125	10.07875	10.11469	10.19344	10
51	9.80671	9.88521	9.92150	10.07850	10.11479	10.19329	9
52	9.80686	9.88510	9.92176	10.07824	10.11490	10.19314	8
53	9.80701	9.88499	9.92202	10.07798	10.11501	10.19299	7
54	9.80716	9.88489	9.92227	10.07773	10.11511	10.19284	6
55	9.80731	9.88478	9.92253	10.07747	10.11522	10.19269	5
56	9.80746	9.88468	9.92279	10.07721	10.11532	10.19254	4
57	9.80762	9.88457	9.92304	10.07696	10.11543	10.19238	3
58	9.80777	9.88447	9.92330	10.07670	10.11553	10.19223	2
59	9.80792	9.88436	9.92356	10.07644	10.11564	10.19208	1
60	9.80807	9.88425	9.92381	10.07619	10.11575	10.19193	0
	Co Sine.	Sine.	Co-tang.	Tangent.	Co-ſecant	Secant.	M.

50 Degrees.

A Table of Artificial Sines, Tang. and Sec. 40 Degrees.

M.	Sine.	Co-ſine.	Tangent.	Co-tang.	Secant.	Co-ſecant.	
0	9.80807	9.88425	9.92381	10.07619	10.11575	10.19193	60
1	9.80822	9.88415	9.92407	10.07593	10.11585	10.19178	59
2	9.80837	9.88404	9.92433	10.07567	10.11596	10.19163	58
3	9.80852	9.88394	9.92458	10.07542	10.11606	10.19148	57
4	9.80867	9.88383	9.92484	10.07516	10.11617	10.19133	56
5	9.80882	9.88372	9.92510	10.07490	10.11628	10.19118	55
6	9.80897	9.88362	9.92535	10.07465	10.11638	10.19103	54
7	9.80912	9.88351	9.92561	10.07439	10.11649	10.19088	53
8	9.80927	9.88340	9.92587	10.07413	10.11660	10.19073	52
9	9.80942	9.88330	9.92612	10.07388	10.11670	10.19058	51
10	9.80957	9.88319	9.92638	10.07362	10.11681	10.19043	50
11	9.80972	9.88308	9.92663	10.07337	10.11692	10.19028	49
12	9.80987	9.88298	9.92689	10.07311	10.11702	10.19013	48
13	9.81002	9.88287	9.92715	10.07285	10.11713	10.18998	47
14	9.81017	9.88276	9.92740	10.07260	10.11724	10.18983	46
15	9.81032	9.88266	9.92766	10.07234	10.11734	10.18968	45
16	9.81046	9.88255	9.92792	10.07208	10.11745	10.18954	44
17	9.81061	9.88244	9.92817	10.07183	10.11756	10.18939	43
18	9.81076	9.88234	9.92843	10.07157	10.11766	10.18924	42
19	9.81091	9.88223	9.92868	10.07132	10.11777	10.18909	41
20	9.81106	9.88212	9.92894	10.07106	10.11788	10.18894	40
21	9.81121	9.88201	9.92920	10.07080	10.11799	10.18879	39
22	9.81136	9.88191	9.92945	10.07055	10.11809	10.18864	38
23	9.81151	9.88180	9.92971	10.07029	10.11820	10.18849	37
24	9.81166	9.88169	9.92996	10.07004	10.11831	10.18834	36
25	9.81180	9.88158	9.93022	10.07978	10.11842	10.18820	35
26	9.81195	9.88148	9.93048	10.07952	10.11852	10.18805	34
27	9.81210	9.88137	9.93073	10.07927	10.11863	10.18790	33
28	9.81225	9.88126	9.93099	10.07901	10.11874	10.18775	32
29	9.81240	9.88115	9.93124	10.07876	10.11885	10.18760	31
30	9.81254	9.88105	9.93150	10.06850	10.11895	10.18746	30
31	9.81269	9.88094	9.93175	10.06825	10.11906	10.18731	29
32	9.81284	9.88083	9.93201	10.06799	10.11917	10.18716	28
33	9.81299	9.88072	9.93227	10.06773	10.11928	10.18701	27
34	9.81314	9.88061	9.93252	10.06748	10.11939	10.18686	26
35	9.81328	9.88050	9.93278	10.06722	10.31949	10.18672	25
36	9.81343	9.88040	9.93303	10.06697	10.11960	10.18657	24
37	9.81358	9.88029	9.93329	10.06671	10.11971	10.18642	23
38	9.81372	9.88018	9.93354	10.06646	10.11982	10.18628	22
39	9.81387	9.88007	9.93380	10.06620	10.11993	10.18613	21
40	9.81402	9.87996	9.93406	10.06594	10.12004	10.18598	20
41	9.81417	9.87985	9.93431	10.06569	10.12015	10.18583	19
42	9.81431	9.87975	9.93457	10.06543	10.12025	10.18569	18
43	9.81446	9.87964	9.93482	10.06518	10.12036	10.18554	17
44	9.81461	9.87953	9.93508	10.06492	10.12047	10.18539	16
45	9.81475	9.87942	9.93533	10.06467	10.12058	10.18525	15
46	9.81490	9.87931	9.93559	10.06441	10.12069	10.18510	14
47	9.81505	9.87920	9.93584	10.06416	10.12080	10.18495	13
48	9.81519	9.87909	9.93610	10.06390	10.12091	10.18481	12
49	9.81534	9.87898	9.93635	10.06364	10.12102	10.18466	11
50	9.81549	9.87887	9.93661	10.06339	10.12112	10.18451	10
51	9.81563	9.87877	9.93687	10.06313	10.12123	10.18437	9
52	9.81578	9.87866	9.93712	10.06288	10.12134	10.18422	8
53	9.81592	9.87855	9.93738	10.06262	10.12145	10.18408	7
54	9.81607	9.87844	9.93763	10.06237	10.12156	10.18393	6
55	9.81622	9.87833	9.93789	10.06211	10.12167	10.18378	5
56	9.81636	9.87822	9.93814	10.06186	10.12178	10.18364	4
57	9.81651	9.87811	9.93840	10.06160	10.12189	10.18349	3
58	9.81665	9.87800	9.93865	10.06135	10.12200	10.18335	2
59	9.81680	9.87789	9.93891	10.06109	10.12211	10.18320	1
60	9.81694	9.87778	9.93916	10.06084	10.12222	10.18306	0
	Co-ſine	Sine	Co-tang.	Tangent.	Co-ſecant	Secant.	M.

49 Degrees,

A Table of Artificial Sines, Tang. and Sec. 41 Degrees.

M.	Sine.	Co-ſine.	Tangent.	Co-tang.	Secant.	Co-ſecant	
0	9.81694	9.87778	9.93916	10.06084	10.12222	10.18306	60
1	9.81709	9.87767	9.93942	10.06058	10.12233	10.18291	59
2	9.81723	9.87756	9.93967	10.06033	10.12244	10.18277	58
3	9.81738	9.87745	9.93993	10.06007	10.12255	10.18262	57
4	9.81752	9.87734	9.94018	10.05982	10.12266	10.18248	56
5	9.81767	9.87723	9.94044	10.05956	10.12277	10.18233	55
6	9.81781	9.87712	9.94069	10.05931	10.12288	10.18219	54
7	9.81796	9.87701	9.93095	10.05905	10.12299	10.18204	53
8	9.81810	9.87690	9.94120	10.05880	10.12310	10.18190	52
9	9.81825	9.87679	9.94146	10.05854	10.12321	10.18175	51
10	9.81839	9.87668	9.94171	10.05829	10.12332	10.18161	50
11	9.81854	9.87657	9.93197	10.05803	10.12343	10.18146	49
12	9.81868	9.87646	9.94222	10.05778	10.12354	10.18132	48
13	9.81882	9.87635	9.94248	10.05752	10.12365	10.18118	47
14	9.81897	9.87624	9.94273	10.05727	10.12376	10.18103	46
15	9.81911	9.87613	9.94299	10.05701	10.12387	10.18089	45
16	9.81926	9.87601	9.94324	10.05676	10.12399	10.18074	44
17	9.81940	9.87590	9.94350	10.05650	10.12410	10.18060	43
18	9.81954	9.87579	9.94375	10.05625	10.12421	10.18046	42
19	9.81969	9.87568	9.94401	10.05599	10.12432	10.18031	41
20	9.81983	9.87557	9.94426	10.05574	10.12443	10.18017	40
21	9.81998	9.87546	9.94452	10.05548	10.12454	10.18002	39
22	9.82012	9.87535	9.94477	10.05523	10.12465	10.17988	38
23	9.82026	9.87524	9.94503	10.05497	10.12476	10.17974	37
24	9.82041	9.87513	9.94528	10.05472	10.12487	10.17959	36
25	9.82055	9.87501	9.94554	10.05446	10.12499	10.17945	35
26	9.82069	9.87490	9.94579	10.05421	10.12510	10.17931	34
27	9.82084	9.87479	9.94604	10.05396	10.12521	10.17916	33
28	9.82098	9.87468	9.94630	10.05370	10.12532	10.17902	32
29	9.82112	9.87457	9.94655	10.05345	10.12543	10.17888	31
30	9.82126	9.87446	9.94681	10.05319	10.12554	10.17874	30
31	9.82141	9.87434	9.94706	10.05294	10.12566	10.17859	29
32	9.82155	9.87423	9.94732	10.05268	10.12577	10.17845	28
33	9.82169	9.87412	9.94757	10.05243	10.12588	10.17831	27
34	9.82184	9.87401	9.94783	10.05217	10.12599	10.17816	26
35	9.82198	9.87390	9.94808	10.05192	10.12610	10.17802	25
36	9.82212	9.87378	9.94834	10.05166	10.12622	10.17388	24
37	9.82226	9.87367	9.94859	10.05141	10.12633	10.17774	23
38	9.82240	9.87356	9.94884	10.05116	10.12644	10.17760	22
39	9.82255	9.87345	9.94910	10.05090	10.12655	10.17745	21
40	9.82269	9.87334	9.94935	10.05065	10.12666	10.17731	20
41	9.82283	9.87322	9.94961	10.05039	10.12678	10.17717	19
42	9.82297	9.87311	9.94986	10.05014	10.12689	10.17703	18
43	9.82311	9.87300	9.95012	10.04988	10.12700	10.17689	17
44	9.82326	9.87288	9.95037	10.04963	10.12711	10.17674	16
45	9.82340	9.87277	9.95062	10.04938	10.12723	10.17660	15
46	9.82354	9.87266	9.95088	10.04912	10.12734	10.17646	14
47	9.82368	9.87255	9.95113	10.04887	10.12745	10.17632	13
48	9.82382	9.87243	9.95139	10.04861	10.12757	10.17618	12
49	9.82396	9.87232	9.95164	10.04836	10.12768	10.17604	11
50	9.82410	9.87221	9.95190	10.04810	10.12779	10.17590	10
51	9.82424	9.87209	9.95215	10.04785	10.12791	10.17576	9
52	9.82439	9.87198	9.95240	10.04760	10.12802	10.17561	8
53	9.82453	9.87187	9.95266	10.04734	10.12813	10.17547	7
54	9.82467	9.87175	9.95291	10.04709	10.12825	10.17533	6
55	9.82481	9.87164	9.95317	10.04683	10.12836	10.17519	5
56	9.82495	9.87153	9.95342	10.04658	10.12847	10.17505	4
57	9.82509	9.87141	9.95368	10.04632	10.12859	10.17491	3
58	9.82523	9.87130	9.95393	10.04607	10.1287	10.17477	2
59	9.82537	9.87119	9.95418	10.04582	10.12881	10.17463	1
60	9.82551	9.87107	9.95444	10.04556	10.12893	10.17449	0
	Co Sine.	Sine.	Co-tang.	Tangent.	Co ſecant	Secant.	M.

H

48 Degrees.

A Table of Artificial Sines, Tang. and Sec. 42 Degrees.

M.	Sine.	Co-ſine.	Tangent.	Co-tang.	Secant.	Co-ſecant	
0	9.82551	9.87107	9.95444	10.04556	10.12893	10.17449	60
1	9.82565	9.87096	9.95469	10.04531	10.12904	10.17435	59
2	9.82579	9.87085	9.95495	10.04505	10.12915	10.17421	58
3	9.82593	9.87073	9.95520	10.04480	10.12927	10.17407	57
4	9.82607	9.87062	9.95545	10.04455	10.12938	10.17393	56
5	9.82621	9.87050	9.95571	10.04429	10.12950	10.17379	55
6	9.82635	9.87039	9.95596	10.04404	10.12961	10.17365	54
7	9.82649	9.87028	9.95621	10.04378	10.12972	10.17351	53
8	9.82663	9.87016	9.95647	10.04353	10.12984	10.17337	52
9	9.82677	9.87005	9.95672	10.04328	10.12995	10.17323	51
10	9.82691	9.86993	9.95698	10.04302	10.13007	10.17309	50
11	9.82705	9.86982	9.95723	10.04277	10.13018	10.17295	49
12	9.82719	9.86970	9.95748	10.04252	10.13030	10.17281	48
13	9.82733	9.86959	9.95774	10.04226	10.13041	10.17267	47
14	9.82747	9.86947	9.95799	10.04201	10.13053	10.17253	46
15	9.82761	9.86936	9.95825	10.04175	10.13064	10.17239	45
16	9.82775	9.86924	9.95850	10.04150	10.13076	10.17226	44
17	9.82788	9.86913	9.95875	10.04125	10.13087	10.17212	43
18	9.82802	9.86902	9.95905	10.04099	10.13098	10.17198	42
19	9.82816	9.86890	9.95926	10.04074	10.13110	10.17184	41
20	9.82830	9.86879	9.95952	10.04048	10.13121	10.17170	40
21	9.82844	9.86867	9.95977	10.04023	10.13133	10.17156	39
22	9.82858	9.86855	9.96002	10.03998	10.13145	10.17142	38
23	9.82872	9.86844	9.96028	10.03972	10.13156	10.17128	37
24	9.82885	9.86832	9.96053	10.03947	10.13168	10.17115	36
25	9.82899	9.86821	9.96078	10.03922	10.13178	10.17101	35
26	9.82913	9.86809	9.96104	10.03896	10.13191	10.17087	34
27	9.82927	9.86798	9.96129	10.03871	10.13202	10.17073	33
28	9.82941	9.86786	9.96155	10.03845	10.13214	10.17059	32
29	9.82955	9.86775	9.96180	10.03820	10.13225	10.17045	31
30	9.82968	9.86763	9.96205	10.03795	10.13237	10.17032	30
31	9.82982	9.86752	9.96231	10.03769	10.13248	10.17018	29
32	9.82996	9.86740	9.96256	10.03744	10.13260	10.17004	28
33	9.83010	9.86728	9.96281	10.03719	10.13272	10.16990	27
34	9.83023	9.86717	9.96307	10.03693	10.13283	10.16977	26
35	9.83037	9.86705	9.96332	10.03668	10.13295	10.16963	25
36	9.83051	9.86694	9.96357	10.03643	10.13306	10.16949	24
37	9.83065	9.86682	9.96383	10.03617	10.13318	10.16935	23
38	9.83078	9.86670	9.96408	10.03592	10.13330	10.16922	22
39	9.83092	9.86659	9.96433	10.03567	10.13341	10.16908	21
40	9.83106	9.86647	9.96459	10.03541	10.13353	10.16894	20
41	9.83119	9.86635	9.96484	10.03516	10.13365	10.16880	19
42	9.83133	9.86624	9.96510	10.03490	10.13376	10.16867	18
43	9.83147	9.86612	9.96535	10.03465	10.13388	10.16853	17
44	9.83161	9.86600	9.96560	10.03440	10.13400	10.16839	16
45	9.83174	9.86589	9.96586	10.03413	10.13411	10.16826	15
46	9.83188	9.86576	9.96611	10.03389	10.13423	10.16812	14
47	9.83202	9.86565	9.96636	10.03364	10.13435	10.16798	13
48	9.83215	9.86554	9.96662	10.03338	10.13446	10.16785	12
49	9.83229	9.86542	9.96687	10.03313	10.13458	10.16771	11
50	9.83242	9.86530	9.96712	10.03288	10.13470	10 16758	10
51	9.83256	9.86518	9.96738	10.03262	10.13482	10.16744	9
52	9.83270	9.86507	9.96763	10.03237	10.13493	10.16730	8
53	9.83283	9.86495	9.96788	10.03212	10.13505	10.16717	7
54	9.83297	9.86483	9.96814	10.03186	10.13517	10.16703	6
55	9.83310	9.86472	9.96839	10.03161	10.13528	10.16690	5
56	9.83324	9.86460	9.96864	10.03136	10.13540	10.16676	4
57	9.83338	9.86448	9.96890	10.03110	10.13552	10.16662	3
58	9.83351	9.86436	9.96915	10.03085	10.13564	10.16649	2
59	9.83365	9.86425	9.96940	10.03060	10.13575	10.16635	1
60	9.83378	9.86413	9.96966	10.03034	10.13587	10.16622	0
	Co-ſine.	Sine.	Co-tang.	Tangent.	Co-ſecant	Secant.	M.

47 Degrees.

A Table of Artificial Sines, Tang. and Sec. 43 Degrees.

M.	Sine.	Co-ſine.	Tangent.	Co-tang.	Secant.	Co-ſecant	
0	9.83378	9.86413	9.96966	10.03034	10.13587	10.16622	60
1	9.83392	9.86401	9.96991	10.03009	10.13599	10.16608	59
2	9.83405	9.86389	9.97016	10.02984	10.13611	10.16595	58
3	9.83419	9.86377	9.97042	10.02958	10,13623	10.16581	57
4	9.83432	9.86366	9.97067	10.02933	10.13634	10.16568	56
5	9.83446	9.86354	9.97092	10.02908	10.13646	10.16554	55
6	9.83459	9.86342	9.97118	10.02882	10.13658	10.16541	54
7	9.83473	9.86330	9.97143	10.02857	10.13670	10.16527	53
8	9.83486	9.86318	9.97168	10.02832	10.13682	10.16513	52
9	9.83500	9.86306	9.97193	10.02807	10.13694	10.16500	51
10	9.83513	9.86295	9.97219	10.02781	10.13705	10.16487	50
11	9.83527	9.86283	9.97244	10.02756	10.13717	10.16473	49
12	9.83540	9.86271	9.97269	10.02731	10.13729	10.16460	48
13	9.83554	9.86259	9.97295	10.02705	10.13741	10.16446	47
14	9.83567	9.86247	9.97320	10.02683	10.13753	10.16433	46
15	9.83581	9.86235	9.97345	10.02655	10.13765	10.16419	45
16	9.83594	9.86223	9.97371	10.02629	10.13777	10.16406	44
17	9.83607	9.86212	9.97396	10.02604	10.13789	10.16392	43
18	9.83621	9.86200	9.97421	10.02579	10.13800	10.16379	42
19	9.83634	9.86188	9.97447	10.02553	10.13812	10.16366	41
20	9.83648	9.86176	9.97472	10.02528	10.13824	10.16352	40
21	9.83661	9.86164	9.97497	10.02503	10.13836	10.16339	39
22	9.83674	9.86152	9.97523	10.02477	10.13848	10.16326	38
23	9.83688	9.86140	9.97548	10.02452	10.13860	10.16312	37
24	9.83701	9.86128	9.97573	10.02427	10.13872	10.16299	36
25	9.83715	9.86116	9.97598	10.02402	10.13884	10.16285	35
26	9.83728	9.86104	9.97624	10.02370	10.13896	10.16272	34
27	9.83741	9.86092	9.97649	10.02351	10.13908	10.16259	33
28	9.83755	9.86080	9.97674	10.02326	10.13920	10.16245	32
29	9.83768	9.86068	9.97700	10.02300	10.13932	10.16232	31
30	9.83781	9.86056	9.97725	10.02275	10.13944	10.16219	30
31	9.83795	9.86044	9.97750	10.02250	10 13956	10.16205	29
32	9.83808	9.86032	9.97776	10.02224	10.13968	10.16192	28
33	9.83821	9.86020	9 97801	10.02199	10.13980	10.16175	27
34	9.83834	9.86008	9.978 6	10.02174	10.13992	10.16166	26
35	9.83848	9.85996	9.97851	10.02149	10.14004	10.16152	25
36	9.83861	9.85984	9.97877	10.02123	10.14016	10.16139	24
37	9.83874	9.85972	9.979 2	10.02098	10.14028	10.16126	23
38	9.83887	9.85960	9.97927	10.02073	10.14040	10.16113	22
39	9 83901	9.85948	9.97953	10.02047	10.14052	10.16099	21
40	9.83914	9.85936	9.97978	10.02022	10.14064	10.16086	20
41	9.83927	9 85924	9.98003	10.01997	10.14076	10.16073	19
42	9.83940	9.85912	9.98029	10.01971	10.14088	10.16060	18
43	9.83954	9 85900	9.98054	10.01946	10.14100	10.16046	17
44	9.83967	9.85888	9.98079	10.01921	10.14112	10.16033	16
45	9.83980	9.85876	9.98104	10.01896	10.14124	10.16020	15
46	9.83993	9.85864	9.98130	10.01870	10.14136	10.16007	14
47	9.84006	9.85851	9.98155	10.01845	10.14140	10.15994	13
48	9.84020	9.85839	9.98180	10.01820	10.14161	10.15980	12
49	9.84033	9.85827	9.98206	10.01794	10.14173	10.15967	11
50	9 84046	9.85815	9.98231	10.01769	10.14185	10.15954	10
51	9.84059	9.85803	9.98256	10.01744	10.14197	10.15941	9
52	9.84072	9.85791	9.98281	10.01719	10.14209	10.15928	8
53	9.84085	9.85779	9.98307	10.01693	10.14221	10.15915	7
54	9 84098	9 85766	9.98332	10.01668	10.14234	10.15902	6
55	9.84112	9.85754	9.98357	10.01643	10.14246	10.15888	5
56	9.84125	9 85742	9.98383	10.01617	10.14258	10.15875	4
57	9.84138	9.85730	9.98408	10.01592	10.14270	10.15862	3
58	9.84151	9.85718	9.98433	10.01567	10.14282	10.15849	2
59	9 84164	9.85706	9.98458	10.01542	10.14294	10.15836	1
60	9.84177	9.85693	9.98484	10.01516	10.14307	10.15823	0
	Co ſine.	Sine.	Co-tang.	Tangent.	Co-ſecant	Secant.	M.

46 Degrees.

A Table of Artificial Sines, Tang. and Sec. 44 Degrees.

M.	Sine.	Co-ſine.	Tangent.	Co-tang.	Secant.	Co-ſecant	
0	9.84177	9.85693	9.98484	10.01516	10.14307	10.15823	60
1	9.84190	9.85681	9.98509	10.01491	10.14319	10.15810	59
2	9.84203	9.85669	9.98534	10.01466	10.14331	10.15797	58
3	9.84216	9.85657	9.98560	10.01440	10.14343	10.15784	57
4	9.84229	9.85645	9.98585	10.01415	10.14355	10.15771	56
5	9.84242	9.85632	9.98610	10.01390	10.14368	10.15758	55
6	9.84255	9.85620	9.98635	10.01365	10.14380	10.15745	54
7	9.84269	9.85608	9.98661	10.01339	10.14392	10.15731	53
8	9.84282	9.85596	9.98686	10.01314	10.14404	10.15718	52
9	9.84295	9.85583	9.98711	10.01289	10.14417	10.15705	51
10	9.84308	9.85571	9.98737	10.01263	10.14429	10.15692	50
11	9.84321	9.85559	9.98762	10.01238	10.14441	10.15679	49
12	9.84334	9.85546	9.98787	10.01213	10.14454	10.15666	48
13	9.84347	9.85534	9.98812	10.01188	10.14466	10.15653	47
14	9.84360	9.85522	9.98838	10.01162	10.14478	10.15640	46
15	9.84372	9.85510	9.98863	10.01137	10.14490	10.15628	45
16	9.84385	9.85497	9.98888	10.01112	10.14503	10.15614	44
17	9.84398	9.85485	9.98913	10.01087	10.14515	10.15602	43
18	9.84411	9.85473	9.98939	10.01061	10.14527	10.15589	42
19	9.84424	9.85460	9.98964	10.01036	10.14540	10.15576	41
20	9.84437	9.85448	9.98989	10.01011	10.14552	10.15563	40
21	9.84450	9.85436	9.99014	10.00985	10.14564	10.15550	39
22	9.84463	9.85423	9.99040	10.00960	10.14577	10.15537	38
23	9.84476	9.85411	9.99065	10.00935	10.14589	10.15524	37
24	9.84489	9.85399	9.99090	10.00910	10.14601	10.15511	36
25	9.84502	9.85386	9.99116	10.00884	10.14614	10.15498	35
26	9.84515	9.85374	9.99141	10.00859	10.14626	10.15485	34
27	9.84528	9.85361	9.99166	10.00834	10.14639	10.15472	33
28	9.84540	9.85349	9.99191	10.00809	10.14651	10.15460	32
29	9.84553	9.85337	9.99217	10.00783	10.14663	10.15447	31
30	9.84566	9.85324	9.99242	10.00758	10.14676	10.15434	30
31	9.84579	9.85312	9.99267	10.00733	10.14688	10.15421	29
32	9.84592	9.85299	9.99293	10.00707	10.14701	10.15408	28
33	9.84605	9.85287	9.99318	10.00682	10.14713	10.15395	27
34	9.84618	9.85274	9.99343	10.00657	10.14726	10.15382	26
35	9.84630	9.85262	9.99368	10.00632	10.14738	10.15370	25
36	9.84643	9.85250	9.99394	10.00606	10.14750	10.15357	24
37	9.84656	9.85237	9.99419	10.00581	10.14763	10.15344	23
38	9.84669	9.85225	9.99444	10.00556	10.14775	10.15331	22
39	9.84682	9.85212	9.99469	10.00531	10.14788	10.15318	21
40	9.84694	9.85200	9.99495	10.00505	10.14800	10.15306	20
41	9.84707	9.85187	9.99520	10.00480	10.14813	10.15293	19
42	9.84720	9.85175	9.99545	10.00455	10.14825	10.15280	18
43	9.84733	9.85162	9.99570	10.00430	10.14838	10.15267	17
44	9.84745	9.85150	9.99596	10.00404	10.14850	10.15255	16
45	9.84758	9.85137	9.99621	10.00379	10.14863	10.15242	15
46	9.84771	9.85125	9.99646	10.00354	10.14875	10.15229	14
47	9.84784	9.85112	9.99672	10.00328	10.14888	10.15216	13
48	9.84796	9.85100	9.99697	10.00303	10.14900	10.15204	12
49	9.84809	9.85087	9.99722	10.00278	10.14913	10.15191	11
50	9.84822	9.85074	9.99747	10.00253	10.14926	10.15178	10
51	9.84834	9.85062	9.99773	10.00227	10.14938	10.15166	9
52	9.84847	9.85049	9.99798	10.00202	10.14951	10.15153	8
53	9.84860	9.85037	9.99823	10.00177	10.14963	10.15140	7
54	9.84873	9.85024	9.99848	10.00152	10.14976	10.15127	6
55	9.84885	9.85012	9.99874	10.00126	10.14988	10.15115	5
56	9.84898	9.84999	9.99899	10.00101	10.15001	10.15102	4
57	9.84911	9.84986	9.99924	10.00076	10.15014	10.15089	3
58	9.84923	9.84974	9.99949	10.00051	10.15026	10.15077	2
59	9.84936	9.84961	9.99975	10.00025	10.15039	10.15064	1
60	9.84948	9.84948	10.00000	10.00000	10.15052	10.15051	0
	Co-ſine	Sine	Co-tang.	Tangent.	Co-ſecant	Secant.	M.

45 Degrees.

TABLE III. A TABLE of Natural Sines.

	0		1		2		3		4		
M.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	M.
0	00	10000	1745	99985	3490	99939	5234	99863	6976	99756	60
1	29	10000	1774	99984	3519	99938	5263	99861	7005	99754	59
2	58	10000	1803	99984	3548	99937	5292	99860	7034	99752	58
3	87	10000	1832	99983	3577	99936	5321	99858	7063	99750	57
4	116	10000	1862	99983	3606	99935	5350	99857	7092	99748	56
5	145	10000	1891	99982	3635	99934	5379	99855	7121	99746	55
6	175	10000	1920	99982	3664	99933	5408	99814	7150	99744	54
7	204	10000	1949	99981	3693	99932	5437	99852	7179	99742	53
8	233	10000	1978	99980	3723	99931	5466	99851	7208	99740	52
9	262	10000	2007	99980	3752	99930	5495	99849	7237	99738	51
10	291	10000	2036	99979	3781	99929	5524	99847	7266	99736	50
11	323	99999	2065	99979	3810	99927	5553	99846	7295	99734	49
12	349	99999	2094	99978	3839	99926	5582	99844	7324	99731	48
13	378	99999	2123	99977	3868	99925	5611	99842	7353	99729	47
14	407	99999	2152	99977	3897	99924	5640	99841	7382	99728	46
15	436	99999	2181	99976	3926	99923	5669	99839	7411	99725	45
16	465	99999	2211	99976	3955	99922	5698	99838	7440	99723	44
17	495	99999	2240	99975	3984	99921	5727	99836	7469	99721	43
18	524	99999	2269	99974	4013	99919	5756	99834	7498	99719	42
19	553	99998	2298	99974	4042	99917	5785	99833	7527	99716	41
20	582	99998	2327	99973	4071	99917	5814	99831	7556	99714	40
21	611	99998	2356	99972	4100	99916	5844	99829	7585	99712	39
22	640	99998	2385	99972	4129	99915	5873	99827	7614	99710	38
23	669	99998	2414	99971	4159	99914	5902	99826	7643	99708	37
24	698	99998	2443	99970	4188	99912	5931	99824	7672	99705	36
25	727	99997	2472	99969	4217	99911	5960	99822	7701	99703	35
26	756	99997	2501	99969	4246	99910	5989	99821	7730	99701	34
27	785	99997	2530	99968	4275	99909	6018	99819	7759	99699	33
28	814	99997	2560	99967	4304	99907	6047	99817	7788	99696	32
29	844	99996	2589	99966	4333	99906	6076	99815	7817	99694	31
30	873	99996	2618	99966	4362	99905	6105	99813	7846	99692	30
31	902	99996	2647	99965	4391	99904	6134	99812	7875	99689	29
32	931	99996	2670	99964	4420	99902	6163	99810	7904	99687	28
33	960	99995	2705	99963	4449	99901	6192	99808	7933	99685	27
34	989	99995	2734	99963	4478	99900	6221	99806	7962	99683	26
35	1018	99995	2763	99962	4507	99898	6250	99804	7991	99680	25
36	1047	99995	2792	99961	4536	99897	6279	99803	8020	99678	24
37	1076	99994	2821	99960	4565	99896	6308	99801	8049	99676	23
38	1105	99994	2850	99959	4594	99894	6337	99799	8078	99673	22
39	1134	99994	2879	99959	4623	99893	6366	99797	8107	99671	21
40	1164	99993	2908	99958	4653	99892	6395	99795	8136	99668	20
41	1193	99993	2938	99957	4682	99890	6424	99793	8165	99666	19
42	1222	99993	2967	99956	4711	99889	6453	99792	8194	99664	18
43	1251	99992	2996	99955	4740	99888	6482	99790	8223	99661	17
44	1280	99992	3025	99954	4769	99886	6511	99788	8252	99659	16
45	1309	99991	3054	99953	4798	99885	6540	99786	8281	99657	15
46	1338	99991	3083	99952	4827	99883	6569	99784	8310	99654	14
47	1367	99991	3112	99952	4856	99882	6590	99782	8339	99652	13
48	1396	99990	3141	99951	4885	99881	6627	99780	8368	99649	12
49	1425	99990	3170	99950	4914	99879	6656	99778	8397	99647	11
50	1454	99989	3199	99949	4943	99878	6685	99776	8426	99644	10
51	1483	99989	3228	99948	4972	99876	6714	99774	8455	99642	9
52	1513	99989	3257	99947	5001	99875	6743	99772	8484	99639	8
53	1542	99988	3286	99946	5030	99873	6773	99770	8513	99637	7
54	1571	99988	3316	99945	5059	99872	6802	99768	8542	99635	6
55	1600	99987	3345	99944	5088	99870	6831	99766	8571	99632	5
56	1629	99987	3374	99943	5117	99869	6860	99764	8600	99630	4
57	1653	99986	3403	99942	5146	99867	6889	99762	8629	99627	3
58	1687	99986	3432	99941	5175	99866	6918	99760	8658	99625	2
59	1716	99985	3461	99940	5205	99864	6947	99758	8687	99622	1
	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	
	89		88		87		86		85		

A TABLE of Natural Sines.

	5		6		7		8		9		
M.	N.ſine	N.Coſ.	N.ſine	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	M.
0	8716	99619	10453	99452	12187	99255	13917	99027	15643	98769	60
1	8745	99617	10482	99449	12216	99251	13946	99023	15672	98764	59
2	8774	99614	10511	99446	12245	99248	13975	99019	15701	98760	58
3	8803	99612	10540	99443	12274	99244	14004	99015	15730	98755	57
4	8831	99609	10569	99440	12302	99240	14033	99011	15758	98751	56
5	8860	99607	10597	99437	12331	99236	14061	99006	15787	98746	55
6	8889	99604	10626	99434	12360	99233	14090	99002	15816	98741	54
7	8918	99602	10655	99431	12389	99230	14119	98998	15845	98737	53
8	8947	99599	10684	99428	12418	99226	14148	98994	15873	98732	52
9	8976	99596	10713	99424	12447	99222	14177	98990	15902	98728	51
10	9005	99594	10742	99421	12476	99219	14205	98986	15931	98723	50
11	9034	99591	10771	99418	12504	99215	14234	98982	15959	98718	49
12	9063	99588	10800	99415	12533	99211	14263	98978	15988	98714	48
13	9092	99586	10829	99412	12562	99208	14292	98973	16017	98709	47
14	9121	99583	10858	99409	12691	99204	14320	98969	16036	98704	46
15	9150	99580	10887	99406	12620	99200	14349	98965	16074	98700	45
16	9179	99578	10916	99402	12649	99197	14378	98961	16103	98695	44
17	9208	99575	10945	99399	12678	99193	14407	98957	16132	98690	43
18	9237	99572	10973	99396	12706	99189	14436	98953	16160	98686	42
19	9266	99570	11002	99393	12735	99186	14464	98948	16189	98681	41
20	9295	99567	11031	99390	12764	99182	14493	98944	12218	98676	40
21	9324	99564	11060	99386	12793	99178	14522	98940	16246	98671	39
22	9353	99562	11089	99383	12822	99175	14551	98936	16275	98667	38
23	9382	99559	11118	99380	12851	99171	14580	98931	16304	98662	37
24	9411	99556	11147	99377	12880	99167	14608	98927	16333	98657	36
25	9440	99553	11176	99374	12908	99163	14637	98923	16361	98652	35
26	9469	99551	11205	99370	12937	99160	14666	98919	16390	98648	34
27	9498	99548	11234	99367	12966	99156	14695	98914	16419	98643	33
28	9527	99545	11263	99364	12995	99152	14723	98910	16447	98638	32
29	9556	99542	11292	99360	13024	99148	14752	98906	16476	98633	31
30	9585	99540	11320	99357	13053	99144	14781	98902	16505	98629	30
31	9614	99537	11349	99354	13081	99141	14810	98897	16533	98624	29
32	9642	99534	11378	99351	13110	99137	14838	98893	16562	98619	28
33	9671	99531	11407	99347	13139	99133	14867	98889	16591	98614	27
34	9700	99528	11436	99344	13168	99129	14896	98884	16620	98609	26
35	9729	99526	11465	99341	13197	99125	14925	98880	16648	98604	25
36	9758	99523	11494	99337	13226	99122	14954	98876	16677	98600	24
37	9787	99520	11523	99334	13254	99118	14982	98871	16706	98595	23
38	9816	99517	11552	99331	13283	99114	15011	98867	16734	98590	22
39	9845	99514	11580	99327	13312	99110	15040	98863	16763	98585	21
40	9874	99511	11609	99324	13341	99106	15069	98858	16792	98580	20
41	9903	99508	11638	99320	13370	99102	15097	98854	16820	98575	19
42	9932	99506	11667	99317	13399	99098	15126	98849	16849	98570	18
43	9961	99503	11696	99314	13427	99094	15155	98845	16878	98565	17
44	9990	99500	11725	99310	13456	99091	15184	98841	16906	98561	16
45	10019	99497	11754	99307	13485	99087	15212	98836	16935	98556	15
46	10048	99494	11783	99303	13514	99083	15241	98832	16964	98551	14
47	10077	99491	11812	99300	13543	99079	15270	98827	16992	98546	13
48	10106	99488	11840	99297	13572	99075	15299	98823	17021	98541	12
49	10135	99485	11869	99293	13600	99071	15327	98818	17050	98536	11
50	10164	99482	11898	99290	13629	99067	15356	98814	17078	98531	10
51	10192	99479	11927	99286	13658	99063	15385	98809	17107	98526	9
52	10221	99476	11956	99283	13687	99054	15414	98805	17136	98521	8
53	10250	99473	11985	99279	13716	99055	15442	98800	17164	98516	7
54	10279	99470	12014	99276	13744	99051	15471	98796	17193	98511	6
55	10308	99467	12043	99272	13773	99047	15500	98791	17222	98506	5
56	10337	99464	12071	99269	13802	99043	15529	98787	17250	98501	4
57	10366	99461	12100	99265	13831	99039	15557	98782	17279	98496	3
58	10395	99458	12129	99262	13860	99035	15586	98778	17308	98491	2
59	10424	99455	12158	99258	13889	99031	15615	98773	17336	98486	1
	N.Coſ.	N.ſine	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	
	84		83		82		81		85		

A Table of Natural Sines.

	10		11		12		13		14		
M.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	M.
0	17365	98481	19081	98163	20791	97815	22495	97437	24192	97030	60
1	17393	98476	19109	98157	20820	97809	22523	97430	24220	97023	59
2	17422	98471	19138	98152	20848	97803	22552	97424	24249	97015	58
3	17451	98466	19167	98146	20877	97797	22580	97417	24277	97008	57
4	17479	98460	19195	98140	20905	97790	22608	97411	24305	97001	56
5	17508	98455	19224	98135	20933	97784	22637	97404	24333	96994	55
6	17537	98450	19252	98129	20962	97778	22665	97398	24361	96987	54
7	17565	98445	19281	98124	20990	97772	22693	97391	24390	96980	53
8	17594	98440	19309	98118	21019	97766	22722	97384	24418	96973	52
9	17623	98435	19338	98112	21047	97760	22750	97378	24446	96966	51
10	17651	98430	19366	98107	21076	97754	22778	97371	24474	96959	50
11	17680	98425	19395	98101	21104	97748	22807	97365	24503	96952	49
12	17708	98420	19423	98096	21132	97742	22835	97358	24531	96945	48
13	17737	98414	19452	98090	21161	97735	22863	97351	24559	96937	47
14	17766	98409	19480	98084	21189	97729	22892	97345	24587	96930	46
15	17794	98404	19509	98079	21218	97723	22920	97338	24615	96923	45
16	17823	98399	19538	98073	21246	97717	22948	97331	24644	96916	44
17	17852	98394	19566	98067	21275	97711	22977	97325	24672	96909	43
18	17880	98388	19595	98061	21303	97705	23005	97318	24700	96902	42
19	17909	98383	19623	98056	21331	97698	23033	97311	24728	96894	41
20	17937	98378	19652	98050	21360	97692	23062	97304	24756	96887	40
21	17966	98373	19680	98044	21388	97686	23090	97298	24784	96880	39
22	17995	98368	19709	98039	21417	97680	23118	97291	24813	96873	38
23	18023	98362	19737	98033	21445	97673	23146	97284	24841	96866	37
24	18052	98357	19766	98027	21474	97667	23175	97278	24869	96858	36
25	18081	98352	19794	98021	21502	97661	23203	97271	24897	96851	35
26	18109	98347	19823	98016	21530	97655	23231	97264	24925	96844	34
27	18138	98341	19851	98010	21559	97648	23260	97257	24953	96837	33
28	18166	98336	19880	98004	21587	97642	23288	97251	24982	96829	32
29	18195	98331	19908	97998	21616	97636	23316	97244	25010	96822	31
30	18224	98325	19937	97992	21644	97630	23345	97237	25038	96815	30
31	18252	98320	19965	97987	21672	97623	23373	97230	25066	96807	29
32	18281	98315	19993	97981	21701	97617	23401	97223	25094	96800	28
33	18309	98310	20022	97975	21729	97611	23429	97217	25122	96793	27
34	18338	98304	20051	97969	21758	97604	23458	97210	25151	96786	26
35	18367	98299	20079	97963	21786	97598	23486	97203	25179	96778	25
36	18395	98294	20108	97958	21814	97592	23514	97196	25207	96771	24
37	18424	98288	20136	97952	21843	97585	23542	97189	25235	96764	23
38	18452	98283	20165	97946	21871	97579	23571	97182	25263	96756	22
39	18481	98277	20193	97940	21899	97573	23599	97176	25291	96749	21
40	18509	98272	20222	97934	21928	97566	23627	97169	25320	96742	20
41	18538	98267	20250	97928	21956	97560	23656	97162	25348	96734	19
42	18567	98261	20271	97922	21985	97553	23684	97155	25376	96727	18
43	18595	98256	20307	97916	22013	97547	23712	97148	25404	96719	17
44	18624	98250	20336	97910	22041	97541	23740	97141	25432	96712	16
45	18652	98245	20364	97905	22070	97534	23769	97134	25460	96705	15
46	18681	98240	20393	97899	22098	97528	23797	97137	25488	96697	14
47	18710	98234	20421	97893	22126	97521	23825	97120	25516	96690	13
48	18738	98229	20450	97887	22155	97515	23853	97113	25545	96682	12
49	18767	98223	20478	97881	22185	97508	23882	97106	25573	96675	11
50	18795	98218	20507	97875	22212	97502	23910	97100	25601	96667	10
51	18824	98212	20535	97869	22240	97496	23938	97093	25629	96660	9
52	18852	98207	20563	97863	22268	97489	23966	97086	25657	96653	8
53	18881	98201	20592	97857	22297	97483	23995	97079	25685	96645	7
54	18910	98196	20620	97851	22325	97476	24023	97072	25713	96638	6
55	18938	98190	20649	97845	22353	97470	24051	97065	25741	96630	5
56	18967	98185	20677	97839	22382	97463	24079	97058	25769	96623	4
57	18995	98179	20706	97833	22410	97457	24108	97051	25798	96615	3
58	19024	98174	20734	97827	22438	97450	24136	97044	25826	96608	2
59	19052	98168	20763	97821	22467	97444	24164	97037	25854	96600	1
	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	
	79		78		77		76		75		

A TABLE of Natural Sines.

	15		16		17		18		19		
M.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	M.
0	25882	96593	27564	96126	29237	95630	30902	95106	32557	94552	60
1	25910	96585	27592	96118	29265	95622	30929	95097	32584	94542	59
2	25938	96578	27620	96110	29293	95613	30957	95088	32612	94533	58
3	25966	96570	27648	96102	29321	95605	30985	95079	32639	94523	57
4	25994	96562	27676	96094	29348	95596	31012	95070	32667	94514	56
5	26022	96555	27704	96086	29376	95588	31040	95061	32694	94504	55
6	26050	96547	27731	96078	29404	95579	31068	95052	32722	94495	54
7	26079	96540	27759	96070	29432	95571	31095	95043	32749	94485	53
8	26107	92532	27787	96062	29460	95562	31123	95033	32877	94476	52
9	26135	96524	27815	96054	29487	95554	31151	95024	32804	94466	51
10	26163	96517	27843	96046	29515	95545	31178	95015	32832	94457	50
11	26191	96509	27871	96037	29543	95536	31206	95006	32859	94447	49
12	26219	96502	27899	96029	29571	95528	31233	94997	32887	94438	48
13	26247	96494	27927	96021	29599	95519	31261	94988	32914	94428	47
14	26275	96486	27955	96013	29626	95511	31289	94979	32942	94418	46
15	26303	96479	27983	96005	29654	95502	31316	94970	32969	94409	45
16	26331	96471	28011	95997	29682	95493	31344	94961	32997	94399	44
17	26359	96463	28039	95989	29710	95485	31372	94952	33024	94390	43
18	26387	96456	28067	95981	29737	95476	31399	94943	33051	94380	42
19	26415	96448	28095	95972	29765	95467	31427	94933	33079	94370	41
20	26443	96440	28123	95964	29793	95459	31454	94924	33106	94361	40
21	26471	96433	28150	95956	29821	95450	31482	94915	33134	94351	39
22	26500	96425	28178	95948	29849	95441	31510	94906	33161	94342	38
23	26528	96417	28206	95940	29876	95433	31537	94897	33189	94332	37
24	26556	96410	28234	95931	29904	95424	31565	94888	33216	94322	36
25	26584	96402	28262	95923	29932	95415	31592	94878	33244	94313	35
26	26612	96394	28290	95915	29960	95407	31620	94869	33271	94303	34
27	26640	96586	28318	95907	29987	95398	31648	94860	33298	94293	33
28	26668	96379	28346	95898	30015	95389	31675	94851	33326	94284	32
29	26296	96371	28374	95890	30043	95380	31703	94842	33353	94274	31
30	26724	96363	28402	95882	30071	95372	31730	94832	33381	94264	30
31	26752	96355	28429	95874	30098	95363	31758	94823	33408	94254	29
32	26780	96347	28457	95865	30126	95354	31786	94814	33436	94245	28
33	26808	96340	28485	95857	30154	95345	31813	94805	33463	94235	27
34	26836	96332	28513	95849	30182	95337	31841	94795	33490	94225	26
35	26864	96324	28541	95841	30209	95328	31868	94786	33518	94216	25
36	26892	96316	28569	95832	30237	95319	31896	94777	33545	94206	24
37	26920	96308	28597	95824	30265	95310	31923	94768	33573	94196	23
38	26948	96301	28625	95816	30292	95301	31951	94758	33600	94186	22
39	26976	96293	28652	95807	30320	95293	31979	94749	33627	94176	21
40	27004	96285	28680	95799	30348	95284	32006	94740	33655	94167	20
41	27032	96277	18708	95791	30376	95275	32034	94730	33682	94157	19
42	27060	96269	28736	95782	30403	95266	32061	94721	33710	94147	18
43	27088	96261	28764	95774	30431	95257	32089	94712	33737	94137	17
44	27116	96253	28792	95769	30459	95248	32116	94702	33764	94127	16
45	27144	96246	28820	95757	30486	95240	32144	94693	33792	94118	15
46	27172	96238	28847	95749	30514	95231	32171	94684	33819	94108	14
47	27200	96230	28875	95740	30542	95222	32199	94674	33846	94098	13
48	27228	96222	28903	05732	30570	95213	32227	94665	33874	94088	12
49	27256	96214	28931	95724	30597	95204	32254	94656	33901	94078	11
50	27284	96206	28959	95715	30625	95195	32282	94646	33929	94068	10
51	27312	96198	28987	95707	30653	95186	32309	94637	33956	94058	9
52	27340	96190	29015	95698	30680	95177	32337	94627	33983	94049	8
53	27368	96182	29042	95690	30708	95168	32364	94618	34011	94039	7
54	27396	96174	29070	95681	30736	95156	32392	94609	34038	94029	6
55	27424	96166	29098	95673	30763	95150	32419	94599	34065	94019	5
56	27452	96158	29126	95664	30791	95142	32447	94590	34093	94009	4
57	27480	96150	29154	95656	30819	95133	32474	94580	34120	93999	3
58	27508	96142	29182	65647	30846	95124	32502	94571	34147	93989	2
59	27536	96134	29209	95639	30874	95115	32529	94561	34175	93979	1
	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	
M.	74		73		72		70		70		

A TABLE of Natural Sines.

	20		21		22		23		24		
M.	N.ſine	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	M.
0	34202	93969	35837	93358	37461	92718	39073	92050	40674	91355	60
1	34229	93959	35864	93348	37488	92707	39100	92039	40700	91343	59
2	34257	93949	35891	93337	37515	92697	39127	92028	40727	91331	58
3	34284	93939	35918	93327	37542	92686	39153	92016	40753	91319	57
4	34311	93929	35945	93316	37569	92675	39180	92005	40780	91307	56
5	34339	93919	35973	93306	37595	92664	39207	91994	40806	91295	55
6	34366	93909	36000	93295	37622	92653	39234	91982	40833	91283	54
7	34393	93899	36027	93285	37649	92642	39260	91971	40860	91272	53
8	34421	93889	36054	93274	37676	92631	39287	91959	40880	91260	52
9	34448	93879	36081	93264	37703	92620	39314	91948	40913	91248	51
10	34475	93869	36108	93253	37730	92609	39341	91936	40939	91236	50
11	34503	93859	36135	93243	37757	92598	39367	91925	40966	91224	49
12	34530	93849	36162	93232	37784	92587	39394	91914	40992	91212	48
13	34557	93839	36190	93222	37811	92576	39421	91902	41019	91200	47
14	34584	93829	36217	93211	37838	92365	39448	91891	41045	91188	46
15	34612	93819	36244	93201	37865	92554	39474	91879	41072	91176	45
16	34639	93809	36271	93190	37892	92543	39501	91868	41098	91164	44
17	34666	93799	36298	93180	37919	92532	39528	91856	41125	91152	43
18	34694	93789	36325	93169	37946	92521	39555	91805	41151	91140	42
19	34721	93779	36352	93159	37973	92510	39581	91833	41178	91128	41
20	34748	93769	36379	93148	37999	92499	39608	91822	41204	91116	40
21	34775	93759	36406	93137	38026	92488	39635	91810	41231	91104	39
22	34803	93749	36433	93127	38053	92477	39661	91799	41257	91092	38
23	34830	93738	36461	93116	38080	92466	39688	91787	41284	91080	37
24	34857	93728	36488	93106	38107	92455	39715	91775	41310	91068	36
25	34884	93718	36515	93095	38134	92444	39741	91764	41337	91056	35
26	34912	93708	36542	93084	38161	92432	39768	91752	41363	91044	34
27	34939	93698	36569	93074	38188	92421	39795	91741	41390	91032	33
28	34966	93688	36596	93063	38215	92410	39822	91729	41416	91020	32
29	34993	93677	36623	93052	38241	92399	39848	91718	41443	91008	31
30	35021	93667	36650	93042	38268	92388	39875	91706	41469	90996	30
31	35048	93657	36677	93031	38295	92377	39902	91694	41496	90984	29
32	35075	93647	36704	92020	38322	92366	39928	91683	41522	90972	28
33	35102	93637	36731	92010	38349	92355	39955	91671	41549	90960	27
34	35130	93626	36758	92999	38376	92343	39982	91660	41575	90948	26
35	35157	93616	36785	92988	38403	92332	40008	91648	41602	90936	25
36	35184	93606	36812	92978	38430	92321	40035	91636	41628	90924	24
37	35211	93596	36839	92967	38456	92310	40062	91625	41655	90911	23
38	35239	93585	36867	92956	38483	92299	40088	91613	41681	90899	22
39	35266	93575	36894	92945	38510	92287	40115	91601	41707	90887	21
40	35293	93565	36921	92935	38537	92276	40141	91590	41734	90875	20
41	35320	93555	36948	92924	38564	92265	40168	91578	41760	90863	19
42	35347	93544	36975	92913	38591	92254	40195	91566	41787	90851	18
43	35375	93534	37002	92902	38617	92243	40221	91555	41813	90839	17
44	35402	93524	37029	92892	38644	92231	40248	91543	41840	90826	16
45	35429	93514	37056	92881	38671	92220	40275	91531	41866	90814	15
46	35456	93503	37083	92870	38698	92209	40301	91519	41892	90802	14
47	35483	93493	37110	92859	38725	92198	40328	91508	41919	90790	13
48	35511	93483	37137	92849	38752	92186	40355	91496	41945	90778	12
49	35538	93472	37164	92838	38778	92175	40381	91484	41972	90766	11
50	35565	93462	37191	92827	38805	92164	40408	91472	41998	90753	10
51	35592	93452	37218	92816	38832	92152	40434	91461	42024	90741	9
52	35619	93441	37245	92805	38859	92141	40461	91449	42051	90729	8
53	35647	93431	37272	92794	38886	92130	40488	91437	42077	90717	7
54	35674	93420	37299	92784	38912	92119	40514	91425	42104	90704	6
55	35701	93410	37326	92773	38939	92107	40541	91414	42130	90692	5
56	35728	93400	37353	92762	38966	92096	40567	91402	42156	90680	4
57	35765	93389	37380	92751	38993	92085	40594	91390	42183	90668	3
58	35782	93379	37407	92740	39020	92073	40621	91378	42209	90655	2
59	35810	93368	37434	92729	39046	92062	40647	91366	42235	90643	1
	N.Coſ.	N.ſine	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	
	69		68		67		66		65		

A TABLE of Natural Sines.

	25		26		27		28		29		
M.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	M.
0	42262	90631	43837	89879	45399	89101	46947	88295	48489	87462	60
1	42288	90618	43863	89867	45425	89087	46973	8281	48506	87448	59
2	42315	90606	43889	89854	45451	89074	46999	88267	48532	87434	58
3	42341	90594	43916	89841	45477	89061	47024	88254	48557	87420	57
4	42367	90582	43942	89828	45503	89048	47050	88240	48583	87405	56
5	42394	90569	43968	89816	45529	89035	47076	88226	48608	87391	55
6	42420	90557	43994	89803	45554	89021	47101	88213	48634	87377	54
7	42446	90545	44020	89790	45580	89008	47127	88199	48659	87363	53
8	42473	90532	44046	89777	45606	88995	47153	88185	48684	87349	52
9	42499	90520	44072	89764	45632	88981	47178	88172	48710	87335	51
10	42525	90507	44098	89752	45658	88968	47204	88158	48735	87321	50
11	42552	90495	44124	89739	45684	88955	47229	88144	48761	87306	49
12	42578	90483	44151	89726	45710	88942	47255	88130	4878	87292	48
13	42604	90470	44177	89713	45736	88928	47281	88117	48811	87278	47
14	42631	90458	44203	89700	45762	88915	47306	88103	48837	87264	46
15	42657	90446	44229	89687	45787	88902	47332	88089	48862	87250	45
16	42683	90433	44255	89674	45813	88888	47358	88075	48888	87235	44
17	42769	90421	44281	89662	45839	88875	47383	88062	48913	87221	43
18	42736	90408	44307	89649	45865	88862	47409	88048	48938	87207	42
19	42762	90396	44333	89636	45891	88848	47434	88034	48964	87193	41
20	42788	90383	44359	89623	45917	88835	4746	88020	48989	87178	40
21	42815	90371	44385	89610	45942	88822	47486	88006	49014	87164	39
22	42841	90358	44411	89597	45968	88808	47511	87993	49040	87150	38
23	42867	90346	44437	89584	45994	88795	47537	87979	49065	87136	37
24	42894	90334	44464	89571	46020	88782	47562	87985	49090	87121	36
25	42920	90321	44490	89558	46046	88768	47588	87951	49116	87107	35
26	42946	90309	44516	89545	46072	88755	47614	87937	49141	87093	34
27	42972	90296	44542	89532	46097	88741	47639	87923	49166	87079	33
28	42999	90284	44568	89519	46123	88728	47665	87909	49192	87064	32
29	43025	90271	44594	89506	46149	88715	47690	87896	49217	87050	31
30	43051	90259	44620	89493	46175	88701	47716	87882	49242	87086	30
31	43077	90246	44646	89480	46201	88688	47741	87868	49268	87021	29
32	43104	90233	44672	89467	46226	88674	47767	87853	49293	87007	28
33	43130	90221	44698	89454	46252	88661	47793	87840	49318	86993	27
34	43156	90208	44724	89441	46278	88647	47818	87826	49344	86978	26
35	43182	90196	44750	89428	46304	88634	47844	87812	49369	86964	25
36	43209	90183	44776	89415	46330	88626	47869	87798	49394	86949	24
37	43235	90171	44802	89402	46355	88607	47895	87784	49419	86935	23
38	43261	90158	44828	89389	46381	88593	47920	87770	49445	86921	22
39	43287	90146	44854	89376	46407	88580	47946	87756	49470	86906	21
40	43313	90133	44880	89363	46433	88566	47972	87743	49495	86892	20
41	43340	90120	44906	89350	46458	88553	47997	87729	49521	86878	19
42	43366	90108	44932	89337	46484	88539	48022	87715	49546	86863	18
43	43392	90095	44958	89324	46510	88526	48048	87701	49571	86849	17
44	43418	90082	44984	89311	46536	88512	48073	87687	49596	86834	16
45	43445	90070	45010	89298	46561	88499	48099	87673	49622	86820	15
46	43471	90057	45036	89285	46587	88485	48124	87659	49647	86809	14
47	43497	90045	45062	89272	46613	88472	48150	87645	49672	86791	13
48	43523	90032	45088	89259	46639	88458	48175	87631	49696	86777	12
49	43549	90019	45114	89245	46664	88445	48201	87617	49723	86762	11
50	43575	90007	45140	89232	46690	88431	48226	87603	49748	86748	10
51	43602	99994	45166	89219	46716	88417	48252	87589	49773	86733	9
52	43628	99981	45192	89206	46742	88404	48277	87575	49798	86719	8
53	43654	99968	45218	89193	46767	88390	48303	87560	49824	86704	7
54	43680	99956	45243	89180	46793	88377	48328	87546	49849	86790	6
55	43706	99943	45269	89167	46819	88363	48354	87532	49874	86675	5
56	43732	99930	45295	89153	46844	88349	48379	87518	49899	86661	4
57	43759	99918	45321	89140	46870	88336	48405	87504	49924	86646	3
58	43785	99905	45347	89127	46896	88322	48430	87490	49950	86632	2
59	43811	99892	45373	89114	46921	88308	48456	87476	49975	86617	1
	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	
	64		63		62		61		60		

A TABLE of Natural Sines.

	30		31		32		33		34		
M.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	M.
0	50000	86603	51504	85717	52992	84805	54464	83867	55919	82904	60
1	50025	86588	51529	85702	53017	84789	54488	83851	55943	82887	59
2	50050	86573	51554	85687	53041	84774	54513	83835	55968	82871	58
3	50076	86559	51579	85672	53066	84759	54537	83819	55992	82855	57
4	50101	86544	51604	85657	53091	84743	54561	83804	56016	82839	56
5	50126	86530	51628	85642	53115	84728	54586	83788	56040	82822	55
6	50151	86515	51653	85627	53140	84712	54610	83772	56064	82806	54
7	50176	86501	51678	85612	53164	84697	54635	83756	56088	82790	53
8	50201	86486	51703	85597	53189	84681	54659	83740	56112	82773	52
9	50227	86471	51728	85582	53214	84666	54683	83724	56136	82757	51
10	50252	86457	51753	85567	53238	84650	54708	83708	56150	82741	50
11	50277	86442	51778	85551	53263	84635	54732	83692	56184	82724	49
12	50302	86427	51803	85536	53288	84619	54756	83676	56208	82718	48
13	50327	86413	51828	85521	53312	84604	54781	83660	56232	82692	47
14	50353	86398	51852	85506	53337	84588	54805	83645	56256	82675	46
15	50378	86384	51877	85491	53361	84573	54829	83629	56280	82659	45
16	50403	86369	51902	85476	53386	84557	54854	83613	56305	82643	44
17	50428	86354	51927	85461	53411	84542	54878	83597	56329	82626	43
18	50453	86340	51952	85446	53435	84526	54902	83581	56358	82610	42
19	50478	86325	51977	85431	53460	84511	54926	83565	56377	82593	41
20	50503	86310	52002	85416	53484	84495	54951	83549	56401	82577	40
21	50528	86295	52026	85401	53509	84480	54975	83533	56425	82561	39
22	50553	86281	52051	85385	53534	84464	54999	83517	56449	82544	38
23	50578	86266	52076	85370	53558	84448	55024	83501	56473	82528	37
24	50603	86251	52101	85355	53583	84433	55048	83485	56497	82511	36
25	50628	86237	52126	85340	53607	84417	55072	83469	56521	82445	35
26	50654	86222	52151	85325	53632	84402	55097	83453	56545	82478	34
27	50679	86207	52175	85310	53656	84386	55121	83437	56569	82462	33
28	50704	86192	52200	85294	53681	84370	55145	83421	56593	82446	32
29	50729	86178	52225	85276	53705	84355	55169	83405	56617	82429	31
30	50754	86163	52250	85264	53720	84339	55194	83389	56641	82413	30
31	50779	86148	52275	85249	53754	84324	55218	83373	56665	82396	29
32	50804	86133	52299	85234	53779	84308	55242	83356	56689	82380	28
33	50829	86119	52324	85218	53804	84292	55266	83340	56713	82363	27
34	50854	86104	52349	85203	53828	84277	55291	83324	56736	82347	26
35	50879	86089	52374	85188	53853	84261	55315	83308	56760	82330	25
36	50904	86074	52398	85173	53877	84245	55339	83292	56784	82314	24
37	50929	86059	52423	85157	53902	84230	55363	83276	56808	82297	23
38	50954	86045	52448	85142	53926	84214	55388	83260	56832	82281	22
39	50979	86030	52473	85127	53951	84198	55412	83244	56856	82264	21
40	51004	86015	52498	85112	53975	84182	55436	83228	56880	82248	20
41	51029	86000	52522	85096	54000	84167	55460	83212	56904	82231	19
42	51054	85985	52547	85081	54024	84151	55484	83195	56928	82214	18
43	51079	85970	52572	85066	54049	84135	55509	83179	56952	82198	17
44	51104	85956	52597	85051	54073	84120	55533	83163	56976	82181	16
45	51129	85941	52621	85035	54097	84104	55557	83147	57000	82165	15
46	51154	85926	52646	85020	54122	84088	55581	83131	57024	82148	14
47	51179	85911	52671	85005	54146	84073	55605	83115	57047	82132	13
48	51204	85896	52696	84989	54171	84057	55630	83098	57071	82115	12
49	51229	85881	52720	84974	54195	84041	55654	83082	57095	82098	11
50	51254	85866	52745	84959	54220	84025	55678	83066	57119	82082	10
51	51279	85851	52770	84943	54244	84009	55702	83050	57143	82065	9
52	51304	85836	52794	84928	54269	83994	55726	83034	57167	82048	8
53	51329	85821	52819	84913	54293	83978	55750	83017	57191	82032	7
54	51354	85806	52844	84897	54317	83962	55775	83001	57215	82015	6
55	51379	85792	52869	84882	54342	83946	55799	82985	57238	81999	5
56	51404	85777	52893	84866	54366	83930	55823	82969	57262	81982	4
57	51429	85762	52918	84851	54391	83915	35847	82953	37286	81965	3
58	51454	85747	52943	84836	54415	83899	55871	82936	57310	81949	2
59	51479	85732	52967	84820	54439	83883	55895	82920	57334	81932	1
	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	N.ſine	N.Coſ.	N.ſine.	
	59		58		57		56		55		

A Table of Natural Sines,

	35		36		37		38		39		
M.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ	N.ſine.	N.Coſ.	M.
0	57358	81915	58779	80902	60181	79864	61566	78801	62932	77715	60
1	57381	81899	58802	80885	60205	79846	61589	78783	62955	77696	59
2	57405	81882	58826	80867	60228	79829	61612	78765	62977	77678	58
3	57429	81865	98849	80850	60251	79811	61635	78747	63000	77660	57
4	57453	81848	58873	80833	60274	79793	61658	78729	63022	77641	56
5	57477	81832	58896	80816	60298	79776	61681	78711	63045	77623	55
6	57501	81815	58520	80799	60321	79758	61704	78693	63068	77605	54
7	57524	81798	58943	80782	60344	79741	61726	78676	63090	77586	53
8	57548	81781	58967	80765	60367	79723	61749	78658	63113	77568	52
9	57572	81765	58990	80748	60390	79706	61772	78640	63135	77550	51
10	57596	81748	59014	80730	60414	79788	61795	78622	63158	77531	50
11	57619	81731	59037	80713	60437	79671	61818	78604	63180	77513	49
12	57643	81714	59061	80696	60460	79653	61841	78586	63203	77494	48
13	57667	81698	59084	80679	60483	79635	61864	78568	63225	77476	47
14	57691	81681	59107	80662	60506	79618	61887	78550	63248	77458	46
15	57715	81664	59131	80644	60529	79600	61909	78532	63271	77439	45
16	57738	81647	59154	80627	60553	79683	61932	78514	63293	77421	44
17	57762	81631	59178	80610	60576	79565	61955	78496	63316	77402	43
18	57786	81614	59201	80593	60599	79547	61978	78478	63338	77384	42
19	57809	81597	59225	80576	60622	79530	62001	78460	63361	77366	41
20	57833	81580	59248	80558	60645	79512	62024	78442	63383	77347	40
21	57857	81565	59272	80541	60668	79594	62046	78424	63406	77329	39
22	57881	81546	59295	80524	60691	79477	62069	78405	63428	77310	38
23	57904	81530	59318	80507	60714	79459	62092	78387	63451	77292	37
24	57929	81513	59342	80489	60738	79441	62115	78369	63473	77273	36
25	57952	81496	59369	80472	60761	79424	62138	78351	63496	77255	35
26	57976	81475	59389	80455	60784	79406	62160	78333	63518	77236	34
27	57999	81462	59412	80438	60807	79388	62183	78315	63540	77218	33
28	58023	81445	59435	80420	60830	79371	62206	78297	63563	77199	32
29	58047	81428	59459	80403	60853	79353	62229	78279	63585	77181	31
30	58070	81412	59482	80386	60876	79335	62251	78261	63608	77162	30
31	58094	81395	59506	80368	60899	79318	62274	78243	63630	77144	29
32	58118	81379	59529	80351	60922	79300	62297	78225	63653	77125	28
33	58141	81361	59552	80334	60945	79282	62320	78206	63675	77107	27
34	58165	81344	59576	80316	60968	79264	62342	78188	63698	77088	26
35	58189	81327	39599	80299	60991	79247	62365	78170	63720	77070	25
36	58212	81310	59622	80282	61015	79229	62388	78152	63742	77051	24
37	58236	81293	59646	80264	61038	79211	62411	78134	63765	77033	23
38	58260	81276	59669	80247	61061	79193	62433	78116	63787	77014	22
39	58283	81259	59693	80230	61084	79176	62456	78098	63810	76996	21
40	58307	81242	59716	80212	61107	79158	62479	78079	63832	76977	20
41	58330	81225	59739	80195	61130	79140	62502	78061	63854	76959	19
42	58354	81208	59763	80178	61153	79122	62524	78043	63877	76940	18
43	58378	81191	59786	80160	61176	79105	62547	78025	63899	76921	17
44	58401	81174	59809	80143	61199	79087	62570	78007	63922	76903	16
45	58425	81157	59832	80125	61222	79069	62592	77988	63944	76884	15
46	58449	81140	59856	80108	61245	79051	62615	77970	63966	76866	14
47	58472	81123	59879	80091	61268	79033	62638	77952	63989	76847	13
48	58496	81106	59902	80073	61291	79015	62660	77934	64011	76828	12
49	58519	81089	59926	80056	61314	78998	62683	77916	64033	76810	11
50	58543	81072	59949	80038	61337	78980	62706	77897	64056	76791	10
51	58567	81055	59972	80021	61360	78962	62728	77879	64078	76772	9
52	58590	81038	59995	80003	61383	78944	62751	77861	64100	76754	8
53	58614	81021	60019	79986	61406	78926	62774	77843	64123	76734	7
54	58637	81004	60042	79968	61429	78908	62796	77824	64145	76717	6
55	58661	80987	60065	79951	61451	78891	62819	77806	64167	76698	5
56	58684	80970	60089	79934	61474	78873	62842	77788	64190	76679	4
57	58708	80953	60112	79916	61497	78855	62864	77769	64212	76661	3
58	58731	80936	60135	79899	61520	78837	62887	77751	64234	76642	2
59	58755	80919	60158	79881	61543	78819	62909	77733	64256	76623	1
	N.Coſ.	N.ſine	N.Coſ.	N.ſine	N.Coſ.	N.ſine	N.Coſ.	N.ſine	N.ſine.	N.Coſ	
	54		53		52		51		50		

A TABLE of Natural Sines.

	40		41		42		43		44		
M.	N.ſine	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	M.
0	64279	76604	65606	75471	66913	74314	68200	73135	69466	71934	60
1	64301	76586	65628	75452	66935	74295	68221	73116	69487	71914	59
2	64323	76567	65650	75433	66956	74276	68242	73096	69508	71894	58
3	64346	76548	65672	75314	66978	74256	68264	73076	69529	71873	57
4	64368	76530	65694	75395	66999	74237	68285	73056	69549	71853	56
5	64390	76511	65715	75375	67021	74217	68306	73036	69570	71833	55
6	64412	76492	65738	75356	67043	74198	68327	73016	69592	71813	54
7	64435	76473	65759	75337	67064	74178	68349	72996	69612	71792	53
8	64457	76455	65781	75318	67086	74159	68370	72976	69633	71772	52
9	64479	76436	65803	75299	67107	74139	68391	72957	69654	71752	51
10	64501	76417	65825	75280	67129	74120	68412	72937	69675	71732	50
11	64524	76398	65847	75261	67151	74100	68433	72917	69696	71711	49
12	64546	76380	65869	75241	67172	74080	68455	72897	69717	71691	48
13	64568	76361	65891	75222	67194	74061	68476	72877	69737	71671	47
14	64590	76342	65913	75203	67215	74041	68497	72857	69758	71650	46
15	64612	76323	65935	75184	67237	74022	68518	72837	69779	71630	45
16	64635	76304	65956	75165	67258	74002	68539	72817	69800	71610	44
17	64657	76286	65978	75146	67280	73983	68561	72797	69821	71590	43
18	64679	76267	66000	75126	67301	73963	68582	72777	69842	71569	42
19	64701	76248	66012	75107	67323	73944	68603	72757	69862	71549	41
20	64723	76229	66044	75088	67344	73924	68624	72737	69883	71529	40
21	64746	76210	66066	75069	67366	73904	68645	72717	69904	71508	39
22	64768	76192	66088	75050	67387	73888	68666	72697	69925	71488	38
23	64790	76173	66109	75030	67409	73865	68688	72677	69946	71468	37
24	64812	76154	66131	75011	67430	73846	68709	72657	69966	71447	36
25	64834	76135	66153	74992	67452	73826	68730	72637	69987	71427	35
26	64856	76116	66175	74973	67473	73806	68751	72617	70008	71407	34
27	64878	76097	66197	74953	67495	73787	68772	72597	70029	71386	33
28	64901	76078	66218	74934	67516	73767	68793	72577	70049	71366	32
29	64923	76059	66240	74915	67538	73747	68814	72557	70070	71345	31
30	64945	76041	66262	74896	67559	73728	68835	72537	70091	71325	30
31	64967	76022	66284	74876	67580	73708	68857	72517	70112	71305	29
32	64989	76003	66306	74858	67602	73688	68878	72497	70132	71284	28
33	65011	75984	66327	74838	67623	73669	68899	72477	70153	71264	27
34	65033	75965	66349	74818	67645	73649	68920	72457	70174	71243	26
35	65055	75946	66371	74799	67666	73629	68941	72437	70195	71223	25
36	65077	75927	66393	74780	67688	73610	68962	72417	70215	71203	24
37	65099	76908	66414	74700	67709	73590	68983	72397	70236	71182	23
38	65122	76889	66436	74741	67730	73570	69004	72377	70257	71162	22
39	65144	76870	66458	74722	67752	73551	69025	72357	70277	71141	21
40	65166	76851	66480	74703	67773	73531	69046	72337	70298	71121	20
41	65188	76832	66501	74683	67795	73511	69067	72317	70319	71100	19
42	65210	76813	66523	74664	67816	73491	69088	72297	70339	71080	18
43	65232	75794	66545	74644	67837	73472	69109	72277	70360	71059	17
44	65254	75775	66566	74625	67859	73452	69130	72257	70381	71039	16
45	65276	75756	66588	74606	67880	74432	69161	72236	70401	71019	15
46	65298	75738	66610	74586	67901	73412	69172	72216	70422	70998	14
47	65320	75719	66632	74567	67923	73393	69193	72196	70443	70978	13
48	65342	75699	66653	74548	67948	73373	69214	72176	70463	70957	12
49	65364	75680	66675	74528	67965	73353	69235	72156	70484	70937	11
50	65386	75661	66697	74509	67987	73333	69256	72136	70505	70916	10
51	65408	75642	66718	74489	68008	73314	69277	73116	70525	70896	9
52	65430	75623	66740	74470	68029	73294	69298	72095	70546	70875	8
53	65452	75604	66762	74451	68051	73275	69319	72075	70567	70855	7
54	65474	75585	66783	74431	68072	73254	69340	72055	70587	70834	6
55	65496	75566	66805	74412	68093	73234	69361	72035	70608	70813	5
56	65518	75547	66827	74392	68115	73215	69382	72015	70628	70793	4
57	65540	75528	66848	74373	68136	73195	69403	71995	70649	70772	3
58	65562	75509	66870	74353	68157	73175	69424	71974	70670	70752	2
59	65583	75490	66891	74334	68179	73155	69445	71954	70690	70731	1
	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	N.Coſ.	N.ſine.	
	49		48		47		46		45		

TABLE IV. A Table for finding the

o HOUR.

M	S.	½ Elapſ. Time.	Middle Time.	Riſing.	M	S.	½ Elapſ. Time.	Middle Time.	Riſing.
0	30	2.66121	2.63982	9.37654 } Co. ar.	30	30	0.87717	4.42386	2.94656
1	00	2.36018	2.94085	9.97860 }	31	00	0.87015	4.43088	2.96067
1	30	2.18409	3.11694	0.33078	31	30	0.86324	4.43779	2.97454
2	00	2.05916	3.24187	0.58066	32	00	0.85644	4.44459	2.98820
2	30	1.96225	3.33878	0.77448	32	30	0.84976	4.45127	3.00164
3	00	1.88307	3.41796	0.93284	33	00	0.84317	4.45786	3.01488
3	30	1.81613	3.48490	1.06673	33	30	0.83669	4.46434	3.02792
4	00	1.75814	3.54289	1.18271	34	00	0.83030	4.47073	3.04077
4	30	1.70700	3.59403	1.28502	34	30	0.82400	4.47703	3.05342
5	00	1.66125	3.63978	1.37653	35	00	0.81780	4.48323	3.06590
5	30	1.61986	3.68117	1.45931	35	30	0.81169	4.48934	3.07819
6	00	1.58208	3.71895	1.53488	36	00	0.80567	4.49536	3.09032
6	30	1.54733	3.75370	1.60440	36	30	0.79973	4.50130	3.10227
7	00	1.51515	3.78588	1.66877	37	00	0.79387	4.50716	3.11406
7	30	1.48520	3.81583	1.72869	37	30	0.78809	4.51294	3.12570
8	00	1.45718	3.84385	1.78474	38	00	0.78239	4.51864	3.13718
8	30	1.43086	3.87017	1.83759	38	30	0.77677	4.52426	3.14850
9	00	1.40605	3.89498	1.88703	39	00	0.77122	4.52981	3.15969
9	30	1.38258	3.91845	1.93399	39	30	0.76574	4.53519	3.17072
10	00	1.36032	3.94071	1.97854	40	00	0.76033	4.54070	3.18162
10	30	1.33915	3.96188	2.02091	40	30	0.75499	4.54604	3.19238
11	00	1.31896	3.98207	2.06131	41	00	0.74972	4.55131	3.20301
11	30	1.29967	4.00136	2.09991	41	30	0.74451	4.55652	3.21351
12	00	1.28120	4.01983	2.13687	42	00	0.73937	4.56166	3.22389
12	30	1.26349	4.03754	2.17232	42	30	0.73429	4.56674	3.23414
13	00	1.24647	4.05456	2.20638	43	00	0.72926	4.57176	3.24427
13	30	1.23010	4.08093	2.23915	43	30	0.72430	4.57673	3.25428
14	00	1.21432	4.08671	2.27073	44	00	0.71940	4.58163	3.26418
14	30	1.19910	4.10193	2.30120	44	30	0.71455	4.58648	3.27396
15	00	1.18440	4.11663	2.33063	45	00	0.70976	4.59127	3.28363
15	30	1.17018	4.13085	2.35910	45	30	0.70503	4.59600	3.29320
16	00	1.15642	4.14461	2.38667	46	00	0.70034	4.60069	3.30266
16	30	1.14307	4.15796	2.41338	46	30	0.69571	4.60532	3.31202
17	00	1.13013	4.17090	2.43930	47	00	0.69113	4.60990	3.32128
17	30	1.11757	4.18346	2.46447	47	30	0.68660	4.61443	3.33044
18	00	1.10536	4.19567	2.48893	48	00	0.68212	4.61891	3.33950
18	30	1.09348	4.20755	2.51271	48	30	0.67769	4.62334	3.34847
19	00	1.08193	4.21910	2.53586	49	00	0.67330	4.62773	3.35734
19	30	1.07067	4.23036	2.55841	9	30	0.66896	4.63207	3.36613
20	00	1.05970	4.24133	2.58039	50	00	0.66466	4.63637	3.37482
20	30	1.04901	4.25202	2.60182	50	30	0.66041	4.64062	3.38343
21	00	1.03857	4.26246	2.62274	51	00	0.65620	4.64483	3.39195
21	30	1.02838	4.27265	2.64316	51	30	0.65204	4.64899	3.40039
22	00	1.01843	4.28260	2.66312	52	00	0.64791	4.65312	3.40875
22	30	1.00870	4.29233	2.68262	32	30	0.64383	4.65730	3.41702
23	00	0.99918	4.30185	2.70170	33	00	0.63978	4.66125	3.42523
23	30	0.98988	4.31115	2.72036	53	30	0.63578	4.66525	3.43334
24	00	0.98077	4.32026	2.73863	54	00	0.63181	4.66922	3.44138
24	30	0.97184	4.32919	2.75652	54	30	0.62789	4.67314	3.44935
25	00	0.96310	4.33793	2.77505	55	00	0.62400	4.67703	3.45724
25	30	0.95454	4.34649	2.79124	55	30	0.62014	4.68089	3.46507
26	00	0.94614	4.35489	2.80809	56	00	0.61632	4.68471	3.47282
26	30	0.93791	4.36313	2.82461	56	30	0.61254	4.68849	3.48050
27	00	0.92982	4.37121	2.84083	57	00	0.60879	4.69224	3.48811
27	30	0.92189	4.37914	2.85675	57	30	0.60508	4.69595	3.49566
28	00	0.91411	4.38692	2.87238	58	00	0.60140	4.69963	3.50314
28	30	0.90646	4.39457	2.88773	58	30	0.59775	4.70328	3.51056
29	00	0.89894	4.40206	2.90282	59	00	0.59414	4.70689	3.51791
29	30	0.80156	4.40947	2.91765	59	30	0.59056	4.71047	3.52520
30	00	0.88430	4.41673	2.93123	60	00	0.58700	4.71403	3.53243

LATITUDE by two Altitudes.

1 HOUR.

M	S.	½ Elapſ. Time.	Middle Time.	Riſing.	M	S.	½ Elapſ. Time.	Middle Time.	Riſing.
00	30	0.58348	4.71755	3.53959	30	30	0.41488	4.88615	3.88625
01	00	0.57999	4.72104	3.54670	31	00	0.41261	4.88842	3.89097
01	30	0.57653	4.72450	3.55375	31	30	0.41036	4.89067	3.89567
02	00	0.57310	4.72793	3.56074	32	00	0.40812	4.89291	3.90034
02	30	0.56970	4.73133	3.56767	32	30	0.40590	4.89513	3.90498
03	00	0.56633	4.73470	3.57455	33	00	0.40368	4.89734	3.90960
03	30	0.56298	4.73805	3.58137	33	30	0.40149	4.89954	3.91420
04	00	0.55966	4.74137	3.58814	34	00	0.39930	4.90173	3.91876
04	30	0.55637	4.74466	3.59486	34	30	0.39713	4.90390	3.92331
05	00	0.55311	4.74792	3.60152	35	00	0.39497	4.90606	3.92782
05	30	0.54987	4.75116	3.60813	35	30	0.39282	4.90821	3.93232
06	00	0.54666	4.75437	3.61469	36	00	0.39069	4.91034	3.93679
06	30	0.54347	4.75756	3.62120	36	30	0.38856	4.91247	3.94123
07	00	0.54031	4.76072	3.62766	37	00	0.38646	4.91457	3.94566
07	30	0.53718	4.76385	3.63407	37	30	0.38436	4.91667	3.95005
08	00	0.53406	4.76697	3.64043	38	00	0.38227	4.91876	3.95443
08	30	0.53097	4.77005	3.64675	38	30	0.38020	4.92083	3.95878
09	00	0.52791	4.77312	3.65302	39	00	0.37814	4.92289	3.96311
09	30	0.52487	4.77616	3.65924	39	30	0.37609	4.92494	3.96742
10	00	0.52186	4.77917	3.66542	40	00	0.37405	4.92698	3.97170
10	30	0.51886	4.78217	3.67156	40	30	0.37203	4.92900	3.97597
11	00	0.51589	4.78514	3.67765	41	00	0.37001	4.93102	3.98021
11	30	0.51294	4.78809	3.68869	41	30	0.36801	4.93302	3.98443
12	00	0.51002	4.79101	3.68969	42	00	0.36602	4.93501	3.98862
12	30	0.50711	4.79392	3.69566	42	30	0.36403	4.93700	3.99280
13	00	0.50423	4.79680	3.70158	43	00	0.36206	4.93897	3.99696
13	30	0.50137	4.79966	3.70745	43	30	0.36011	4.94092	4.00109
14	00	0.49852	4.80251	3.71329	44	00	0.35816	4.94287	4.00521
14	30	0.49570	4.80533	3.71909	44	30	0.35622	4.94481	4.00930
15	00	0.49290	4.80813	3.72485	45	00	0.35429	4.94673	4.01337
15	30	0.49012	4.81091	3.73057	45	30	0.35238	4.94865	4.01743
16	00	0.48736	4.81367	3.73625	46	00	0.35047	4.95056	4.02146
16	30	0.48462	4.81641	3.74189	46	30	0.34858	4.95245	4.02547
17	00	0.48189	4.81914	3.74750	47	00	0.34669	4.95134	4.02947
17	30	0.47919	4.82184	3.75307	47	30	0.34482	4.95621	4.03344
18	00	0.47650	4.82453	3.75860	48	00	0.34295	4.95808	4.03140
18	30	0.47384	4.82719	3.76409	48	30	0.34110	4.95993	4.04134
19	00	0.47119	4.82984	3.76955	49	00	0.33925	4.96178	4.04526
19	30	0.46856	4.83247	3.77498	49	30	0.33742	4.96361	4.04916
20	00	0.46595	4.83508	5.78037	50	00	0.33559	4.96544	4.05304
20	30	0.46335	4.83768	3.78573	50	30	0.33378	4.96725	4.05690
21	00	0.46078	4.84025	3.79105	51	00	0.33197	4.96906	4.06074
21	30	0.45822	4.84281	3.79634	51	30	0.33018	4.97085	4.06457
22	00	0.45567	4.84536	3.80159	52	00	0.32839	4.97264	4.06838
22	30	0.45315	4.84788	3.80682	52	30	0.32661	4.97442	4.07217
23	00	0.45064	4.85039	3.81201	53	00	0.32485	4.97618	4.07595
23	30	0.44815	4.85288	3.81717	53	30	0.32309	4.97794	4.07970
24	00	0.44567	4.85536	3.82230	54	00	0.32134	4.97969	4.08344
24	30	0.44321	4.85782	3.82739	54	30	0.31960	4.98143	4.08716
25	00	0.44077	4.86026	3.83246	55	00	0.31787	4.98316	4.09087
25	30	0.43834	4.86269	3.83749	55	30	0.31614	4.98489	4.09456
26	00	0.43592	4.86511	3.84250	56	00	0.31443	4.98660	4.09823
26	30	0.43353	4.86750	3.84748	56	30	0.31272	4.98831	4.10188
27	00	0.43114	4.86989	3.85242	57	00	0.31103	4.99000	4.10552
27	30	0.42878	4.87225	3.85734	57	30	0.30934	4.99169	4.10914
28	00	0.42642	4.87461	3.86223	58	00	0.30766	4.99337	4.11275
28	30	0.42409	4.87694	3.86709	58	30	0.30599	4.99504	4.11634
29	00	0.42176	4.87927	3.87192	59	00	0.30433	4.99670	4.11992
29	30	0.41945	4.88158	3.87672	59	30	0.30268	4.99835	4.12348
30	00	0.41716	4.88387	3.88150	60	00	0.30103	5.00000	4.12702

A TABLE for finding the
2 HOURS.

M	S.	$\frac{1}{2}$ Elapſ. Time.	Middle Time.	Riſing.	M	S.	$\frac{1}{2}$ Elapſ. Time.	Middle Time.	Riſing.
00	30	0.29939	5.00164	4.13055	30	30	0.21432	5.08671	4.31801
01	00	0.29776	5.00327	4.13406	31	00	0.21309	5.08794	4.32079
01	30	0.29614	5.00489	4.13756	31	30	0.21187	5.08916	4.32355
02	00	0.29453	5.00650	4.14104	32	00	0.21066	5.09037	4.32631
02	30	0.29293	5.00810	4.14451	32	30	0.20945	5.09158	4.32906
03	00	0.29133	5.00970	4.14797	33	00	0.20824	5.09279	4.33180
03	30	0.28974	5.01129	4.15140	33	30	0.20704	5.09399	4.33452
04	00	0.28816	5.01287	4.15483	34	00	0.20585	5.09518	4.33724
04	30	0.28659	5.01444	4.15824	34	30	0.20466	5.09637	4.33995
05	00	0.28502	5.01601	4.16163	35	00	0.20348	5.09755	4.34265
05	30	0.28346	5.01757	4.16501	35	30	0.20230	5.09873	4.34534
06	00	0.28191	9.01912	4.16838	36	00	0.20113	5.09990	4.34802
06	30	0.28037	5.02066	4.17173	36	30	0.19996	5.10107	4.35069
07	00	0.27884	5.02219	4.17507	37	00	0.19880	5.10223	4.35335
07	30	0.27731	5.02372	4.17839	37	30	0.19764	5.10339	4.35600
08	00	0.27579	5.02524	4.18171	38	00	0.19648	5.10454	4.35865
08	30	0.27428	5.02675	4.18500	38	30	0.19534	5.10569	4.36128
09	00	0.27277	5.02826	4.18829	39	00	0.19420	5.10683	4.36391
09	30	0.27127	5.02976	4.19156	39	30	0.19306	5.10797	4.36652
10	00	0.26978	5.03125	4.19482	40	00	0.19193	5.10910	4.36913
10	30	0.26830	5.03273	4.19806	40	30	0.18080	5.11023	4.37173
11	00	0.26682	5.03421	4.20129	41	00	0.18968	5.11135	4.37432
11	30	0.26535	5.03568	4.20451	41	30	0.18857	5.11246	4.37690
12	00	0.26389	5.03714	4.20771	42	00	0.18746	5.11357	4.37948
12	30	0.26244	5.03859	4.21091	42	30	0.18635	5.11468	4.38204
13	00	0.26099	5.04004	4.21409	43	00	0.18525	5.11578	4.38460
13	30	0.25955	5.04148	4.21725	43	30	0.18415	5.11688	4.38714
14	00	0.25811	5.04292	4.22041	44	00	0.18306	5.11797	4.38968
14	30	0.25668	5.04435	4.22355	44	30	0.18197	5.11906	4.39221
15	00	0.25526	5.04577	4.22668	45	00	0.18089	5.12014	4.39473
15	30	0.25385	5.04718	4.22980	45	30	0.17981	5.12122	4.39724
16	00	0.25244	5.04859	4.23290	46	00	0.17874	5.12229	4.39975
16	30	0.25104	5.04999	4.23599	46	30	0.17767	5.12336	4.40225
17	00	0.24964	5.05139	4.23907	47	00	0.17660	5.12443	4.40474
17	30	0.24825	5.05278	4.24214	47	30	0.17554	5.12549	4.40722
18	00	0.24687	5.05416	4.24520	48	00	0.17449	5.12654	4.40969
18	30	0.24550	5.05553	4.24829	48	30	0.17344	5.12759	4.41215
19	00	0.24413	5.05690	4.25128	49	00	0.17239	5.12864	4.41461
19	30	0.24277	5.05826	4.25430	49	30	0.17135	5.12968	4.41706
20	00	0.24141	5.05962	4.25731	50	00	0.17031	5.13071	4.41950
20	30	0.24006	5.06097	4.26031	50	30	0.16928	5.13174	4.42193
21	00	0.23871	5.06232	4.26330	51	00	0.16826	5.13277	4.42435
21	30	0.23738	5.06365	4.26628	51	30	0.16724	5.13379	4.42677
22	00	0.23605	5.06498	4.26924	52	00	0.16622	5.13481	4.42918
22	30	0.23472	5.06631	4.27220	52	30	0.16520	5.13583	4.43158
23	00	0.23340	5.06763	4.27514	53	00	0.16419	5.13684	4.43398
23	30	0.23209	5.06894	4.27807	53	30	0.16319	5.13784	4.43636
24	00	0.23078	5.07025	4.28099	54	00	0.16219	5.13884	4.43874
24	30	0.22948	5.07155	4.28391	54	30	0.16119	5.13984	4.44111
25	00	0.22819	5.07284	4.28681	55	00	0.16020	5.14083	4.44384
25	30	0.22690	5.07413	4.28969	55	30	0.15921	5.14182	4.44583
26	00	0.22561	5.07542	4.29257	56	00	0.15823	5.14280	4.44818
26	30	0.22433	5.07670	4.29544	56	30	0.15725	5.14378	4.45052
27	00	0.22306	5.07797	4.29830	57	00	0.15627	5.14476	4.45286
27	30	0.22180	5.07923	4.30115	57	30	0.15530	5.14573	4.45518
28	00	0.22054	5.08049	4.30398	58	00	0.15434	5.14669	4.45750
28	30	0.21928	5.08175	4.30681	58	30	0.15338	5.14765	4.45981
29	00	0.21803	5.08300	4.30963	59	00	0.15241	5.14861	4.46212
29	30	0.21679	5.08424	4.31244	59	30	0.15146	5.14957	4.46442
10	00	0.21555	5.08548	4.31522	60	00	0.15051	5.15052	4.46671

LATITUDE by two Altitudes.

3 HOURS.

M	S.	½ Elapſ. Time.	Middle Time.	Riſing.	M	S.	½ Elapſ. Time.	Middle Time.	Riſing.
00	30	0.14957	5.15146	4.46899	30	30	0.09981	5.20122	4.59436
01	00	0.14863	5.15247	4.47127	31	00	0.09909	5.20194	4.59627
01	30	0.14769	5.15334	4.47354	31	30	0,09837	5.20266	4.59818
02	00	0.14676	5.15427	4.47580	32	00	0.09766	5.20338	4.60008
02	30	0.14583	5.15520	4.47806	32	30	0.09694	5.20409	4.60198
03	00	0.14490	5.15613	4.48031	33	00	0.09623	5.20480	4.60388
03	30	0.14398	5.15705	4.48255	33	30	0.09552	5.20551	4.60577
04	00	0.14306	5.15797	4.48479	34	00	0.09482	5.20621	4.60765
04	30	0.14215	5.15888	4.48702	34	30	0.09412	5.20691	4.60952
05	00	0.14124	5.15979	4.48924	35	00	0.09342	5.20760	4.61139
05	30	0.14034	5.16069	4.49145	35	30	0.09273	5.20830	4.61326
06	00	0.13944	9.16159	4.49366	36	00	0.09204	5.20899	4.61512
06	30	0.13854	5.16249	4.49586	36	30	0.09135	5.20268	4.61698
07	00	0.13765	5.16338	4.49806	37	00	0.09067	5.21036	4.61883
07	30	0.13676	5.16427	4.50025	37	30	0.08999	5.21104	4.62068
08	00	0.13587	5.16516	4.50243	38	00	0.08931	5.21172	4.62252
08	30	0.13499	5.16604	4.50460	38	30	0.08864	5.21239	4.62436
09	00	0.13411	5.16692	4.50677	39	00	0.08797	5.21306	4.62619
09	30	0.13324	5.16779	4.50893	39	30	0.08730	5.21373	4.62802
10	00	0.13237	5.16866	4.51109	40	00	0.08664	5.21439	4.62984
10	30	0.13150	5.16953	4.51324	40	30	0.08597	5.21505	4.63166
11	00	0.13064	5.17039	4.51539	41	00	0,08531	5.21571	4.63347
11	30	0.12971	5.17125	4.51753	41	30	0.08466	5.21637	4.63528
12	00	0.12893	5.17210	4.51966	42	00	0.08401	5.21702	4.63708
12	30	0.12808	5.17295	4.52178	42	30	0.08336	5.21767	4.63888
13	00	0.12723	5.17380	4.52390	43	00	0.08271	5.21832	4.64067
13	30	0.12638	5.17465	4.52601	43	30	0.08207	5.21896	4.64246
14	00	0.12554	5.17549	4.52812	44	00	0.08143	5.21960	4.64425
14	30	0.12474	5.17633	4.53022	44	30	0.08079	5.22025	4.64603
15	00	0.12387	5.17716	4.53231	45	00	0.08015	5.22088	4.64780
15	30	0.12305	5.17799	4.53440	45	30	0.07952	5.22151	4.64957
16	00	0.12222	5.17881	4.53648	46	00	0.07889	5.22214	4.65134
16	30	0.12140	5.17963	4.53856	46	30	0.07827	5.22276	4.65310
17	00	0.12058	5.18045	4.54063	47	00	0.07765	5.22338	4.65486
17	30	0.11977	5.18126	4.54269	47	30	0.07703	5.22400	4.65661
18	00	0.11896	5.18207	4.54475	48	00	0.07641	5.22462	4.65806
18	30	0.11815	5.18288	4.54680	48	30	0.07579	5.22524	4.66010
19	00	0.11734	5.18369	4.54885	49	00	0.07518	5.22585	4.66184
19	30	0.11654	5.18449	4.55089	49	30	0.07457	5.22646	4.66357
20	00	0.11574	5.18529	4.55293	50	00	0.07397	5.22707	4.66539
20	30	0.11495	5.18608	4.55496	50	30	0.07337	5.22766	4.66702
21	00	0.11416	5.18687	4.55698	51	00	0.07277	5.22826	4.66874
21	30	0.11337	5.18766	4.55900	51	30	0.07217	5.22886	4.67046
22	00	0.11259	5.18844	4.56101	52	00	0.07158	5.22945	4.67217
22	30	0.11181	5.18922	4.56301	52	30	0.07099	5.23004	4.67388
23	00	0.11104	5.18999	4.56501	53	00	0.07040	5.23062	4.67558
23	30	0.11027	5.19076	4.56701	53	30	0.06981	5.23123	4.67728
24	00	0.10950	5.19153	4.56900	54	00	0.06923	5.23180	4.67897
24	30	0.10873	5.19230	4.57098	54	30	0.06865	5.23238	4.68066
25	00	0.10797	5.19306	4.57296	55	00	0.06808	5.23295	4.68235
25	30	0.10721	5.19382	4.57494	55	30	0.06751	5.23352	4.68403
26	00	0.10645	5.19458	4.57690	56	00	0.06694	5.23409	4.68571
26	30	0.10570	5.19533	4.57886	56	30	0.06637	5.23466	4.68738
27	00	0.10495	5.19608	4.58082	57	00	0.06580	5.23523	4.68905
27	30	0.10421	5.10682	4.58277	57	30	0.06524	5.23579	4.69071
28	00	0,10347	5.19756	4.58471	58	00	0.06468	5.23635	4.69237
28	30	0.10273	5.19830	4.58665	58	30	0.06412	5.23691	4.69403
29	00	0.10199	5.19904	4.58859	59	00	0.06357	5.23746	4.69568
29	30	0.10126	5.19977	4.59052	59	30	0.06302	5.23801	4.69733
30	00	0.10053	5.10050	4.59244	60	00	0.06247	5.23856	4.69897

A TABLE for finding the

4 HOUR.

M	S.	½ Elapſ. Time.	Middle Time.	Riſing.	M	S.	½ Elapſ. Time.	Middle Time.	Riſing.
00	30	0.06192	5.23911	4.70001	30	30	0.03399	5.26704	4.79193
01	00	0.06138	5.23965	4.70224	31	00	0.03360	5.26743	4.79334
01	30	0.06084	5.24019	4.70387	31	30	0.03321	5.26782	4.79475
02	00	0.06030	5.24073	4.70550	32	00	0.03283	5.26820	4.79616
02	30	0.05977	5.24126	4.70712	32	30	0.03245	5.26858	4.79756
03	00	0.05924	5.24179	4.70874	33	00	0.03207	5.26896	4.79896
03	30	0.05871	5.24232	4.71036	33	30	0.03170	5.26934	4.80036
04	00	0.05818	5.24285	4.71197	34	00	0.03132	5.26971	4.80175
04	30	0.05766	5.24337	4.71352	34	30	0.03095	5.27008	4.80314
05	00	0.05714	5.24389	4.71518	35	00	0.03058	5.27045	4.80452
05	30	0.05662	5.24441	4.71678	35	30	0.03021	5.27082	4.80591
06	00	0.05610	5.24493	4.71837	36	00	0.02985	5.27118	4.80729
06	30	0.05559	5.24544	4.71996	36	30	0.02949	5.27154	4.80867
07	00	0.05508	5.24595	4.72155	37	00	0.02913	5.27190	4.81004
07	30	0.05457	5.24646	4.72313	37	30	0.02877	5.27226	4.81141
08	00	0.05406	5.24697	4.72471	38	00	0.02841	5.27262	4.81278
08	30	0.05356	5.24747	4.72628	38	30	0.02806	5.27297	4.81414
09	00	0.05306	5.24797	4.72786	39	00	0.02771	5.27332	4.81550
09	30	0.05256	5.24847	4.72942	39	30	0.02736	5.27367	4.81686
10	00	0.05207	5.24897	4.73098	40	00	0.02701	5.27402	4.81821
10	30	0.05158	5.24945	4.73254	40	30	0.02667	5.27436	4.81956
11	00	0.05109	5.24994	4.73410	41	00	0.02633	5.27470	4.82091
11	30	0.05060	5.25043	4.73565	41	30	0.02599	5.27504	4.82226
12	00	0.05012	5.25091	4.73720	42	00	0.02565	5.27538	4.82360
12	30	0.04964	5.25139	4.73874	42	30	0.02532	5.27571	4.82494
13	00	0.04916	5.25187	4.74028	43	00	0.02499	5.27604	4.82628
13	30	0.04868	5.25235	4.74182	43	30	0.02466	5.27637	4.82761
14	00	0.04821	5.25282	4.74335	44	00	0.02433	5.27670	4.82894
14	30	0.04774	5.25329	4.74488	44	30	0.02400	5.27703	4.83027
15	00	0.04727	5.25376	4.74641	45	00	0.02368	5.27735	4.83159
15	30	0.04680	5.25423	4.74793	45	30	0.02336	5.27767	4.83291
16	00	0.04634	5.25469	4.74945	46	00	0.02304	5.27799	4.83423
16	30	0.04588	5.25515	4.75096	46	30	0.02272	5.27831	4.83554
17	00	0.04542	5.25561	4.75247	47	00	0.02241	5.27862	4.83685
17	30	0.04496	5.25607	4.75398	47	30	0.02210	5.27893	4.83816
18	00	0.04451	5.25652	4.75549	48	00	0.02179	5.27924	4.83947
18	30	0.04406	5.25697	4.75699	48	30	0.02148	5.27955	4.84077
19	00	0.04361	5.25742	4.75848	49	00	0.02118	5.27985	4.84207
19	30	0.04316	5.25787	4.75997	49	30	0.02088	5.28015	4.84337
20	00	0.04272	5.25831	4.76146	50	00	0.02058	5.28045	4.84466
20	30	0.04228	5.25875	4.76295	50	30	0.02028	5.28075	4.84595
21	00	0.04184	5.25919	4.76443	51	00	0.01998	5.28105	4.84724
21	30	0.04141	5.25962	4.76591	51	30	0.01969	5.28134	4.84853
22	00	0.04098	5.26005	4.76738	52	00	0.01940	5.28163	4.84981
22	30	0.04055	5.26048	4.76885	52	30	0.01911	5.28192	4.85109
23	00	0.04012	5.26091	4.77032	53	00	0.01882	5.28221	4.85236
23	30	0.03969	5.26134	4.77197	53	30	0.01854	5.28249	4.85363
24	00	0.03927	5.26176	4.77325	54	00	0.01826	5.28277	4.85490
24	30	0.03885	5.26218	4.77471	54	30	0.01798	5.28305	4.85617
25	00	0.03843	5.26260	4.77616	55	00	0.01770	5.28333	4.85744
25	30	0.03801	5.26302	4.77761	55	30	0.01743	5.28360	4.85870
26	00	0.03760	5.26343	4.77906	56	00	0.01716	5.28387	4.85996
26	30	0.03719	5.26384	4.78050	56	30	0.01689	5.28414	4.86121
27	00	0.03678	5.26425	4.78194	57	00	0.01662	5.28441	4.86246
27	30	0.03638	5.26466	4.78338	57	30	0.01635	5.28468	4.86371
28	00	0.03597	5.26506	4.78481	58	00	0.01609	5.28494	4.86496
28	30	0.03557	5.26546	4.78624	58	30	0.01583	5.28520	4.86621
29	00	0.03517	5.26586	4.78767	59	00	0.01557	5.28546	4.86745
29	30	0.03478	5.26626	4.78909	59	30	0.01531	5.28572	4.86869
30	00	0.03418	5.26665	4.79051	60	00	0.01505	5.28598	4.86993

LATITUDE by two Altitudes.

5 HOUR.

M	S.	½ Elapſ. Time.	Middle Time.	Riſing.	M	S.	½ Elapſ. Time.	Middle Time.	Riſing.
00	30	0.01480	5.28623	4.87116	30	30	0.00361	5.29742	4.94033
01	00	0.01455	5.28648	4.87239	31	00	0.00349	5.29754	4.94141
01	30	0.01430	5.28673	4.87362	31	30	0.00337	5.29766	4.94248
02	00	0.01405	5.28698	4.87484	32	00	0.00325	5.29778	4.94356
02	30	0.01381	5.28722	4.87606	32	30	0.00313	5.29790	4.94463
03	00	0.01357	5.28746	4.87728	33	00	0.00302	5.29801	4.94570
03	30	0.01333	5.28770	4.87850	33	30	0.00291	5.29812	4.94676
04	00	0.01309	5.28794	4.87971	34	00	0.00280	5.29823	4.94782
04	30	0.01286	5.28817	4.88092	34	30	0.00269	5.29834	4.94888
05	00	0.01263	5.28840	4.88213	35	00	0.00259	5.29844	4.94994
05	30	0.01240	5.28863	4.88334	35	30	0.00249	5.29854	4.95100
06	00	0.01217	5.28886	4.88454	36	00	0.00239	5.29864	4.95205
06	30	0.01194	5.28909	4.88574	36	30	0.00229	5.29874	4.95310
07	00	0.01172	5.28931	4.88694	37	00	0.00219	5.29884	4.95415
07	30	0.01150	5.28953	4.88814	37	30	0.00209	5.29894	4.95520
08	00	0.01128	5.28975	4.88933	38	00	0.00200	5.29903	4.95624
08	30	0.01106	5.28997	4.89052	38	30	0.00191	5.29912	4.95728
09	00	0.01084	5.29019	4.89171	39	00	0.00182	5.29921	4.95832
09	30	0.01063	5.29040	4.89289	39	30	0.00174	5.29929	4.95936
10	00	0.01042	5.29061	4.89407	40	00	0.00166	5.29937	4.96040
10	30	0.01021	5.29082	4.89525	40	30	0.00157	5.29945	4.96143
11	00	0.01000	5.29103	4.89643	41	00	0.00150	5.29953	4.96246
11	30	0.00980	5.29123	4.89760	41	30	0.00142	5.29961	4.96349
12	00	0.00960	5.29143	4.89877	42	00	0.00134	5.29969	4.96452
12	30	0.00940	5.29163	4.89994	42	30	0.00127	5.29976	4.96554
13	00	0.00920	5.29183	4.90111	43	00	0.00120	5.29983	4.96656
13	30	0.00900	5.29203	4.90227	43	30	0.00113	5.29990	4.96758
14	00	0.00881	5.29222	4.90343	44	00	0.00106	5.29997	4.96860
14	30	0.00862	5.29241	4.90459	44	30	0.00099	5.30004	4.96961
15	00	0.00843	5.29260	4.90575	45	00	0.00093	5.30010	4.97062
15	30	0.00824	5.29279	4.90690	45	30	0.00087	5.30016	4.97163
16	00	0.00805	5.29298	4.90805	46	00	0.00081	5.30022	4.97264
16	30	0.00787	5.29316	4.90920	46	30	0.00075	5.30028	4.97365
17	00	0.00769	5.29334	4.91035	47	00	0.00070	5.30033	4.97465
17	30	0.00751	5.29352	4.91149	47	30	0.00065	5.30038	4.97565
18	00	0.00733	5.29370	4.91263	48	00	0.00060	5.30043	4.97665
18	30	0.00716	5.29387	4.91377	48	30	0.00055	5.30048	4.97765
19	00	0.00699	5.29404	4.91490	49	00	0.00050	5.30053	4.97865
19	30	0.00682	5.29421	4.91603	49	30	0.00045	5.30058	4.97964
20	00	0.00665	5.29438	4.91716	50	00	0.00041	5.30062	4.98063
20	30	0.00648	5.29455	4.91829	50	30	0.00037	5.50066	4.98162
21	00	0.00632	5.29471	4.91942	52	00	0.00033	2.30070	4.98261
21	30	0.00616	5.29487	4.92054	51	30	0.00029	5.30074	4.98359
22	00	0.00600	5.29503	4.92166	52	00	0.00026	5.30077	4.98457
22	30	0.00584	5.29519	4.92278	52	30	0.00023	5.30080	4.98555
23	00	0.00568	5.29535	4.92390	53	00	0.00020	5.30083	4.98653
23	30	0.00553	5.29550	4.92501	53	30	0.00017	5.30086	4.98751
24	00	0.00538	5.29565	4.92612	54	00	0.00015	5.30088	4.98848
24	30	0.00523	5.29580	4.92723	54	30	0.00012	5.30090	4.98945
25	00	0.00508	5.29595	4.92834	55	00	0.00010	5.30092	4.99042
25	30	0.00494	5.29609	4.92944	55	30	0.00008	5.30094	4.99139
26	00	0.00480	5.29623	4.93054	56	00	0.00007	5.30096	4.99236
26	30	0.00466	5.29637	4.93164	56	30	0.00005	5.30098	4.99332
27	00	0.00452	5.29651	4.93274	57	00	0.00004	5.30099	4.99428
27	30	0.00438	5.29665	4.93383	57	30	0.00003	5.30100	4.99524
28	00	0.00425	5.29678	4.93492	58	00	0.00002	5.30101	4.99620
28	30	0.00412	5.29691	4.93601	58	30	0.00001	5.30102	4.99715
29	00	0.00399	5.29704	4.93709	59	00	0.00000	5.30103	4.99810
29	30	0.00386	5.29717	4.93817	59	30	0.00000	5.30103	4.99905
30	00	0.00373	5.29730	4.93925	60	00	0.00000	5.30103	4.00000

TABLE V. Difference of Latitude and Departure for ¼ Point.

Diſt.	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.
1	01.0	00.0	61	60.9	03.0	121	120.8	05.9	181	180.8	08.9	241	240.7	11.8
2	02.0	00.1	62	61.9	03.0	122	121.8	06.0	182	181.8	08.9	242	241.7	11.9
3	03.0	00.1	63	62.9	3.1	123	122.8	06.0	183	182.8	09.0	243	242.7	11.9
4	04.0	00.2	64	63.9	03.1	124	123.8	06.1	184	183.8	09.0	244	243.7	12.0
5	05.0	00.2	65	64.9	03.2	125	124.8	06.1	185	184.8	09.1	245	244.7	12.0
6	06.0	00.3	66	65.9	03.2	126	125.8	06.2	186	185.8	09.1	246	245.7	12.1
7	07.0	00.3	67	66.9	03.3	127	126.8	06.2	187	186.8	09.2	247	246.7	12.1
8	08.0	00.4	68	67.9	03.3	128	127.8	06.3	188	187.8	09.2	248	247.7	12.2
9	09.0	00.4	69	68.9	03.4	129	128.8	06.3	189	188.8	09.3	249	248.7	12.2
10	10.0	00.1	70	69.9	03.4	130	129.8	06.4	190	189.8	09.3	250	249.7	12.3
11	11.0	00.5	71	70.9	03.5	131	130.8	06.4	191	190.8	09.4	251	250.7	12.3
12	12.0	00.6	72	71.9	03.5	132	131.8	06.5	192	191.8	09.4	252	251.7	12.4
13	13.0	00.6	73	72.9	03.6	133	132.8	06.5	193	192.8	09.5	253	252.7	12.4
14	14.0	00.7	74	73.9	03.6	134	133.8	06.6	194	193.8	09.5	254	253.7	12.5
15	15.0	00.7	75	74.9	03.7	135	134.8	06.6	195	194.8	09.6	255	254.7	12.5
16	16.0	00.8	76	75.9	03.7	136	135.8	06.7	196	195.8	09.6	256	255.7	12.6
17	17.0	00.8	77	76.9	03.8	137	136.8	06.7	197	196.8	09.7	257	256.7	12.6
18	18.0	00.9	78	77.9	03.8	138	137.8	06.8	198	197.8	09.7	258	257.7	12.7
19	19.0	00.9	79	78.9	03.9	139	138.8	06.8	199	198.8	09.8	259	258.7	12.7
20	20.0	01.0	80	79.9	03.9	140	139.8	06.9	200	199.8	09.8	260	259.7	12.8
21	21.0	01.0	81	80.9	04.0	141	140.8	06.9	201	200.8	09.9	261	260.7	12.8
22	22.0	01.1	82	81.9	04.0	142	141.8	07.0	202	201.8	09.9	262	261.7	12.9
23	23.0	01.1	83	82.9	04.1	143	142.8	07.0	203	202.8	10.0	263	262.7	12.9
24	24.0	01.2	84	83.9	04.1	144	143.8	07.1	204	203.8	10.0	264	263.7	13.0
25	25.0	01.2	85	84.9	04.2	145	144.8	07.1	205	204.8	10.1	265	264.7	13.0
26	26.0	01.3	86	85.9	04.2	146	145.8	07.2	206	205.8	10.1	266	265.7	13.1
27	27.0	01.3	87	86.9	04.3	147	146.8	07.2	207	206.8	10.2	267	266.7	13.1
28	28.0	01.4	88	87.9	04.3	148	147.8	07.3	208	207.8	10.2	268	267.7	13.2
29	29.0	01.4	89	88.9	04.4	149	148.8	07.3	209	208.7	10.3	269	268.7	13.2
30	30.0	01.5	90	89.9	04.4	150	149.8	07.4	210	209.7	10.3	270	269.7	13.3
31	31.0	01.5	91	90.9	04.5	151	150.8	07.4	211	210.7	10.4	271	270.7	13.3
32	32.0	01.6	92	91.9	04.5	152	151.8	07.5	212	211.7	10.4	272	271.7	13.4
33	33.0	01.6	93	92.9	04.6	153	152.8	07.5	213	212.7	10.5	273	272.7	13.4
34	34.0	01.7	94	93.9	04.6	154	153.8	07.6	214	213.7	10.5	274	273.7	13.5
35	35.0	01.7	95	94.9	04.7	155	154.8	07.6	215	214.7	10.6	275	274.7	13.5
36	36.0	01.8	96	95.9	04.7	156	155.8	07.7	216	215.7	10.6	276	275.7	13.6
37	37.0	01.8	97	96.9	04.8	157	156.8	07.7	217	216.7	10.7	277	276.7	13.6
38	38.0	01.9	98	97.9	04.8	158	157.8	07.8	218	217.7	10.7	278	277.7	13.7
39	39.0	01.9	99	98.9	04.9	159	158.8	07.8	219	218.7	10.8	279	278.7	13.7
40	40.0	02.0	100	99.9	04.9	160	159.8	07.9	220	219.7	10.8	280	279.7	13.8
41	41.0	02.0	101	100.9	05.0	161	160.8	07.9	221	220.7	10.9	281	280.7	13.8
42	41.9	02.1	102	101.9	05.0	162	161.8	08.0	222	221.7	10.9	282	281.7	13.9
43	42.9	02.1	103	102.9	05.1	163	162.8	08.0	223	222.7	11.0	283	282.7	14.9
44	43.9	02.2	104	103.9	05.1	164	163.8	08.1	224	223.7	11.0	284	283.7	14.0
45	44.9	02.2	105	104.9	05.2	165	164.8	08.1	225	224.7	11.1	285	284.7	14.0
46	45.9	02.3	106	105.9	05.2	166	165.8	08.2	226	225.7	11.1	286	285.7	14.1
47	46.9	02.3	107	106.9	05.3	167	166.8	08.2	227	226.7	11.2	287	286.7	14.1
48	47.9	02.4	108	107.9	05.3	168	167.8	08.3	228	227.7	11.2	288	287.7	14.2
49	48.9	02.4	109	108.9	05.4	169	168.8	08.3	229	228.7	11.3	289	288.7	14.2
50	49.9	02.5	110	109.9	05.4	170	169.8	08.4	230	229.7	11.3	290	289.7	14.3
51	50.9	02.5	111	110.9	05.5	171	170.8	08.4	231	230.7	11.4	291	290.7	14.3
52	51.9	02.6	112	111.9	05.5	172	171.8	08.5	232	231.7	11.4	292	291.6	14.4
53	52.9	02.6	113	112.9	05.5	173	172.8	08.5	233	232.7	11.5	293	292.6	14.4
54	53.9	02.7	114	113.9	05.6	174	173.8	08.5	234	233.7	11.5	294	293.6	14.5
55	54.9	02.7	115	114.9	05.6	175	174.8	08.6	235	234.7	11.5	295	294.6	14.5
56	55.9	02.8	116	115.9	05.7	176	175.8	08.6	236	235.7	11.6	296	295.6	14.5
57	56.9	02.8	117	116.9	05.7	177	176.8	08.7	237	236.7	11.6	297	296.6	14.6
58	57.9	02.9	118	117.9	05.8	178	177.8	08.7	238	237.7	11.7	298	297.6	14.6
59	58.9	02.9	119	118.9	05.8	179	178.8	08.8	239	238.7	11.7	299	298.6	14.7
60	59.9	02.9	120	119.9	05.9	180	179.8	08.8	240	239.7	11.8	300	299.6	14.7
Diſt.	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.

For 7 ¼ Points.

Difference of Latitude and Departure for ½ Point.

Diſt.	Lat.	Dep	Diſt	Lat.	Dep.	Diſt	Lat.	Dep	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.
1	01.0	00.1	61	60.7	06.0	121	120.4	11.8	181	180.1	17.7	241	239.8	23.6
2	02.0	00.2	62	61.7	06.1	122	121.4	11.9	182	181.1	17.8	242	240.8	23.7
3	03.0	00.3	6	62.7	06.2	123	122.4	12.0	183	182.1	17.9	243	241.8	23.8
4	04.0	00.4	64	63.7	06.3	124	123.4	12.1	184	183.1	18.0	244	242.8	23.9
5	05.0	00.5	65	64.7	06.4	125	124.4	12.2	185	184.1	18.1	245	243.8	24.0
6	06.0	00.6	66	65.7	06.5	126	125.4	12.3	186	185.1	18.2	246	244.8	24.1
7	07.0	00.7	67	66.7	06.6	127	126.4	12.4	187	186.1	18.3	247	245.8	24.2
8	08.0	00.8	68	67.7	06.7	128	127.4	12.5	188	187.1	18.4	248	246.8	24.3
9	09.0	00.9	69	68.7	06.7	129	128.4	12.6	189	188.1	18.5	249	247.8	24.4
10	00.0	01.0	70	69.7	06.8	130	129.4	12.7	190	189.1	18.6	250	248.8	24.5
11	10.9	01.1	71	70.7	06.9	131	130.4	12.8	191	190.1	18.7	251	249.8	24.6
12	11.9	01.2	72	71.7	07.0	132	131.4	12.9	192	191.1	18.8	252	250.8	24.7
13	12.9	01.3	73	72.6	07.1	133	132.4	13.0	193	192.1	18.9	253	251.8	24.8
14	13.9	01.4	74	73.6	07.2	134	133.4	13.1	194	193.1	19.0	254	252.8	24.9
15	14.9	01.5	75	74.6	07.3	135	134.4	13.2	195	194.1	19.1	255	253.8	25.0
16	15.9	01.6	76	75.6	07.4	136	135.3	13.3	196	195.1	19.2	256	254.8	25.1
17	16.9	01.7	77	76.6	07.5	137	136.3	13.4	197	196.1	19.3	257	255.8	25.2
18	17.9	01.8	78	77.6	07.6	138	137.3	13.5	198	197.0	19.4	258	256.8	25.3
19	18.9	01.9	79	78.6	07.7	139	138.3	13.6	199	198.0	19.5	259	257.8	25.4
20	19.9	02.0	80	79.6	07.8	140	139.3	13.7	200	199.0	19.6	260	258.8	25.5
21	20.9	02.1	81	80.6	07.9	141	140.3	13.8	201	200.0	19.7	261	259.7	25.6
22	21.9	02.2	82	81.6	08.0	142	141.3	13.9	202	201.0	19.8	262	260.7	25.7
23	22.9	02.2	83	82.6	08.1	143	142.3	14.0	203	202.0	19.9	263	261.7	25.8
24	23.9	02.3	84	83.6	08.2	144	143.3	14.1	204	203.0	20.0	264	262.7	25.9
25	24.9	02.4	85	84.6	08.3	145	144.3	14.2	205	204.0	20.1	265	263.7	26.0
26	25.9	02.5	86	85.6	08.4	146	145.3	14.3	206	205.0	20.2	266	264.7	26.1
27	26.9	02.6	87	86.6	08.5	147	146.3	14.4	207	206.0	20.2	267	265.7	26.2
28	27.9	02.7	88	87.6	08.6	148	147.3	14.5	208	207.0	20.3	268	266.7	26.3
29	28.9	02.8	89	88.6	08.7	149	148.3	14.6	209	208.0	20.4	269	267.7	26.4
30	29.9	02.9	90	89.6	08.8	150	149.3	14.7	210	209.0	20.5	270	268.7	26.5
31	30.9	03.0	91	90.6	08.9	151	150.3	14.8	211	210.0	20.6	271	269.7	26.6
32	31.8	03.1	92	91.6	09.0	152	151.3	14.9	212	211.0	20.7	272	270.7	26.7
33	32.8	03.2	93	92.6	09.1	153	152.3	15.0	213	212.0	20.8	273	271.7	26.8
34	33.8	03.3	94	93.5	09.2	154	153.3	15.1	214	213.0	20.9	274	272.7	26.9
35	34.8	03.4	95	94.5	09.3	155	154.3	15.2	215	214.0	21.0	275	273.7	27.0
36	35.8	03.5	96	95.5	09.4	156	155.3	15.3	216	215.0	21.1	276	274.7	27.1
37	36.8	03.6	97	96.5	09.5	157	156.2	15.4	217	216.0	21.2	277	275.7	27.2
38	37.8	03.7	98	97.5	09.6	158	157.2	15.5	218	217.0	21.3	278	276.7	27.3
39	38.8	03.8	99	98.5	09.7	159	158.2	15.6	219	217.9	21.4	279	277.7	27.4
40	39.8	03.9	100	99.5	09.8	160	159.2	15.7	220	218.9	21.5	280	278.7	27.5
41	40.8	04.0	101	100.5	09.9	161	160.2	15.7	221	219.9	21.6	281	279.6	27.6
42	41.8	04.1	102	101.5	10.0	162	161.2	15.8	222	220.9	21.7	282	280.6	27.7
43	42.8	04.2	103	102.5	10.1	163	162.2	15.9	223	221.9	21.8	283	281.6	27.8
44	43.8	04.3	104	103.5	10.2	164	163.2	16.0	224	222.9	21.9	284	282.6	27.9
45	44.8	04.4	105	104.5	10.3	165	164.2	16.1	225	223.9	22.0	285	283.6	28.0
46	45.8	04.5	106	105.5	10.4	166	165.2	16.2	226	224.9	22.1	286	284.6	28.1
47	46.8	04.6	107	106.5	10.5	167	166.2	16.3	227	225.9	22.2	287	285.6	28.2
48	47.8	04.7	108	107.5	10.6	168	167.2	16.4	228	226.9	22.3	288	286.6	28.3
49	48.8	04.8	109	108.5	10.7	169	168.2	16.5	229	227.9	22.4	289	287.6	28.4
50	49.8	04.9	110	109.5	10.8	170	169.2	16.6	230	228.9	22.5	290	288.6	28.5
51	50.8	05.0	111	110.5	10.9	171	170.2	16.7	231	229.9	22.6	291	289.6	28.6
52	51.8	05.1	112	111.5	11.0	172	171.2	16.8	232	230.9	22.7	292	290.6	28.7
53	52.7	05.2	113	112.5	11.1	173	172.2	16.9	233	231.9	22.8	293	291.6	28.8
54	53.7	05.3	114	113.5	11.2	174	173.2	17.0	234	232.9	22.9	294	292.6	28.9
55	54.7	05.4	115	114.5	11.2	175	174.2	17.1	235	233.9	23.0	295	293.6	29.0
56	55.7	05.5	116	115.5	11.3	176	175.2	17.2	236	234.9	23.1	296	294.6	29.1
57	56.7	05.6	117	116.5	11.4	177	176.2	17.3	237	235.9	23.2	297	295.6	29.2
58	57.7	05.7	118	117.5	11.5	178	177.1	17.4	238	236.9	23.3	298	296.6	29.2
59	58.7	05.8	119	118.5	11.6	179	178.1	17.5	239	237.9	23.4	299	297.6	29.3
60	59.7	05.9	120	119.5	11.7	180	179.1	17.6	240	238.8	23.5	300	208.6	29.4
Diſt.	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.

for 7½ Points.

Difference of Latitude and Departure for ¾ Points.

Diſt.	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.
1	01.0	00.1	61	60.3	08.9	121	119.7	17.7	181	179.0	26.5	241	238.4	35.3
2	02.0	00.3	92	61.3	09.1	122	120.7	17.8	182	180.0	26.7	242	239.4	35.5
3	03.0	00.4	63	62.3	09.2	123	121.7	18.0	183	181.0	26.8	243	240.4	35.6
4	04.0	00.6	64	63.3	09.4	124	122.7	18.2	184	182.0	27.0	244	241.3	35.8
5	04.9	00.7	65	64.3	09.5	125	123.6	18.3	185	183.0	27.1	245	242.3	35.9
6	05.9	00.9	66	65.3	09.7	126	124.6	18.5	186	184.0	27.3	246	243.3	36.1
7	06.9	01.0	67	66.3	09.8	127	125.6	18.6	187	185.0	27.4	247	244.3	36.2
8	07.9	01.2	68	67.3	10.0	128	126.6	18.8	188	186.0	27.6	248	245.3	36.4
9	08.9	01.3	69	68.2	10.1	129	127.6	18.9	189	186.9	27.7	249	246.3	36.5
10	09.9	01.5	70	69.2	10.3	130	128.6	19.1	190	187.9	27.9	250	247.3	36.7
11	10.9	01.6	71	70.2	10.4	131	129.6	19.2	191	188.9	28.0	251	248.3	36.8
12	11.9	01.8	72	71.2	10.6	132	130.6	19.4	192	189.9	28.2	252	249.3	37.0
13	12.9	01.9	73	72.2	10.7	133	131.6	19.5	193	190.9	28.3	253	250.2	37.1
14	13.8	02.1	74	73.2	10.8	134	132.5	19.6	194	191.9	28.5	254	251.2	37.3
15	14.8	02.2	75	74.2	11.0	135	133.5	19.8	195	192.9	28.6	255	252.2	37.4
16	15.8	02.3	76	75.2	11.1	136	134.5	19.9	196	193.9	28.7	256	253.2	37.5
17	16.8	02.5	77	76.2	11.2	137	135.5	20.1	197	194.9	28.9	257	254.2	37.7
18	17.8	02.6	78	77.1	11.4	138	136.5	20.2	198	195.8	29.0	258	255.2	37.8
19	18.8	02.8	79	78.1	11.6	139	137.5	20.4	199	196.8	29.2	259	256.2	38.0
20	19.8	02.9	80	79.1	11.7	140	138.5	20.5	200	197.8	29.3	260	257.2	38.1
21	20.8	03.1	81	80.1	11.9	141	139.5	20.7	201	198.8	29.5	261	258.2	38.3
22	21.8	03.2	82	81,1	12.0	142	140.5	20.8	202	199.8	29.6	262	259.1	38.4
23	22.7	03.4	83	82,1	12.2	143	141.4	21.0	203	200.8	29.8	263	260.1	38.6
24	23.7	03.5	84	83.1	12.3	144	142.4	21.1	204	201.8	29.9	264	261.1	38.7
25	24.7	03.7	85	84.1	12.5	145	143.4	21.3	205	202.8	30.1	265	262.1	38.9
26	25.2	03.8	86	85.1	12.6	146	144.4	21.4	206	203.8	30.2	266	263.1	39.0
27	26.7	04.0	87	86.1	12.8	147	145.4	21.6	207	204.7	30.4	267	264.1	39.2
28	27.7	04.1	88	87.0	12.9	148	146.4	21.7	208	205.7	30,5	268	265.1	39.3
29	28.7	04.3	89	88.0	13.0	149	147.4	21.8	209	206.7	30.6	269	266.1	39.5
30	29.7	04.4	90	89.0	13.2	150	148.4	22.0	210	207.7	30.8	270	267.1	39,6
31	30.7	04.5	91	90.0	13.3	151	149.4	22.1	211	208.7	30.9	271	268.1	39.7
32	31.7	04.7	92	91.0	13.5	152	150.3	22.3	212	209.7	31.1	272	269.0	39.9
33	32.6	04.8	93	92.0	13.6	153	151.3	22.4	213	210.7	31.2	273	270.0	40.0
34	33.6	05.0	94	93.0	13.8	154	152.3	22.6	214	211.7	31.4	274	271.0	40.2
35	34.6	05.1	95	94.0	13.9	155	153.3	22.7	215	212.7	31.5	275	272.0	40.3
36	35.6	05.3	96	95.0	14.1	156	154.3	22.9	216	213.7	31.7	276	273.0	40.5
37	36.6	05.4	97	95.9	14.2	157	155.3	23.0	217	214.6	31.8	277	274.0	40.6
38	37.6	05.6	98	96.9	14.4	158	156.3	23.2	218	215.6	32.0	278	275.0	40.8
39	38.6	05.7	99	97.9	14.5	159	157.3	23.3	219	216.6	32.1	279	276.0	40.9
40	39.6	05.9	100	98.9	14.7	160	158.3	23.5	220	217.6	32.3	280	277.0	41.1
41	40.6	06.0	101	99.9	14.8	161	159.2	23.6	221	218.6	32.4	281	277.9	41.2
42	41.5	06.2	102	100.9	15.0	162	160.2	23.8	222	219.6	32.6	282	278.9	41.4
43	42.5	06,3	103	101.9	15.1	163	161.2	23.9	223	220.6	32.7	283	279.9	41.5
44	43.5	06.5	104	102.9	15.3	164	162.2	24.0	224	221.6	32.8	284	280.9	41.6
45	44.5	06.6	105	103.9	15.4	165	163.2	24.2	225	222.6	33.0	285	281.9	41.8
46	45.5	06.7	106	104.8	15.5	166	164.2	24.3	226	223.5	33.1	286	282.9	41.9
47	46.5	06,9	107	105.8	15.7	167	165.2	24.5	227	224.5	33.3	287	283.9	42.1
48	47.5	07.0	108	106.8	15.8	168	166.2	24.7	228	225.5	33.4	288	284.9	42.2
49	48.5	07.2	109	107.8	16.0	169	167.2	24.8	229	226.5	33.6	289	285.9	42.4
50	49.5	07.3	110	108.8	16.1	170	168.1	24.9	230	227.5	33.7	290	286.8	42.5
51	50.4	07.5	111	109.8	16.3	171	169.1	25.1	231	228.5	33.9	291	287.8	42.7
52	51.4	07.6	112	110.8	16.4	172	170.1	25.2	232	229.5	34.0	292	288.8	42.8
53	52.4	07.8	113	111.8	16.6	173	171.1	25.4	233	230.5	34.2	293	289.8	43.0
54	53.4	07.9	114	112.8	16.7	174	172.1	25.5	234	231.5	34.3	294	290.8	43.1
55	54.4	08.1	115	113.7	16.9	175	173.1	25.7	235	232.4	34.5	295	291.8	43.3
56	55.4	08.2	116	114.7	17.0	176	174.1	25.8	236	233.4	34.6	296	292.8	43.4
57	56.4	08.4	117	115.7	17.2	177	175.1	26.0	237	234.4	34.8	297	293.8	43.6
58	57.4	08.5	118	116.7	17.3	178	176.1	26.1	238	235.4	34.9	298	294.8	43.7
59	58.4	08.6	119	117.7	17.5	179	177,1	26.3	239	236.4	35.0	299	295.8	43.8
60	59.3	08.8	120	118,7	17.6	180	178.0	26.4	240	237.4	35.2	300	296.8	44.0
Diſt.	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.

for 7¼ Points.

Difference of Latitude and Departure for 1 Point.

Diſt.	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.
1	00.0	00.2	61	59.8	11.9	121	118.7	23.6	181	177.5	35.3	241	236.3	47.0
2	01.0	00.4	62	60.8	12.1	122	119.6	23.8	182	178.5	35.5	242	237.3	47.2
3	02.9	00.6	63	61.8	12.3	123	120.6	24.0	183	179.5	35.7	243	238.3	47.4
4	03.9	00.8	64	62.8	12.5	124	121.6	24.2	184	180.4	35.9	244	239.3	47.6
5	04.9	01.0	65	63.7	12.7	125	122.6	24.4	185	181.4	36.1	245	240.3	47.8
6	05.9	01.2	66	64.7	12.9	126	123.6	24.6	186	182.4	36.3	246	241.2	48.0
7	06.9	01.4	67	65.7	13.1	127	124.5	24.8	187	183.4	36.5	247	242.2	48.2
8	07.8	01.6	68	66.7	13.3	128	125.5	25.0	188	184.4	36.7	248	243.2	48.4
9	08.8	01.8	69	67.7	13.5	129	126.5	25.2	189	185.3	36.9	249	244.2	48.6
10	09.8	02.0	70	68.6	13.7	130	127.5	25.4	190	186.3	37.1	250	245.2	48.8
11	10.8	02.1	71	69.6	13.9	131	128.5	25.6	191	187.3	37.3	251	246.1	49.0
12	11.8	02.3	72	70.6	14.0	132	129.5	25.8	192	188.3	37.5	252	247.1	49.2
13	12.7	02.5	73	71.6	14.2	133	130.4	26.0	193	189.3	37.7	253	248.1	49.4
14	13.7	02.7	74	72.6	14.4	134	131.4	26.1	194	190.2	37.9	254	249.1	49.6
15	14.7	02.9	75	73.6	14.6	135	132.4	26.3	195	191.2	38.0	255	250.1	49.8
16	15.7	03.1	76	74.5	14.8	136	133.4	26.5	196	192.2	38.2	256	251.1	50.0
17	16.7	03.3	77	75.5	15.0	137	134.4	26.7	197	193.2	38.4	257	252.1	50.1
18	17.7	03.5	78	76.5	15.2	138	135.3	26.9	198	194.2	38.6	258	253.0	50.3
19	18.6	03.7	79	77.5	15.4	139	136.3	27.1	199	195.2	38.8	259	254.0	50.5
20	19.6	03.9	80	78.5	15.6	140	137.3	27.3	200	196.1	39.0	260	255.0	50.7
21	20.6	04.1	81	79.4	15.8	141	138.3	27.5	201	197.1	39.2	261	256.0	50.9
22	21.6	04.3	82	80.4	16.0	142	139.3	27.7	202	198.1	39.4	262	256.9	51.1
23	22.6	04.5	83	81.4	16.2	143	140.2	27.9	203	199.1	39.6	263	257.9	51.3
24	23.5	04.7	84	82.4	16.4	144	141.2	28.1	204	200.1	39.8	264	258.9	51.5
25	24.5	04.9	85	83.4	16.6	145	142.2	28.3	205	201.0	40.0	265	259.9	51.7
26	25.5	05.1	86	84.3	16.8	146	143.2	28.5	206	202.0	40.2	266	260.9	51.9
27	26.5	05.3	87	85.3	17.0	147	144.2	28.7	207	203.0	40.4	267	261.8	52.1
28	27.5	05.5	88	86.3	17.2	148	145.1	28.9	208	204.0	40.6	268	262.8	52.3
29	28.4	05.3	89	87.3	17.4	149	146.1	29.1	209	205.0	40.8	269	263.8	52.5
30	29.4	05.9	90	88.3	17.6	150	147.1	29.3	210	205.9	41.0	270	264.8	52.7
31	30.4	06.0	91	89.2	17.8	151	148.1	29.5	211	206.9	41.2	271	265.8	52.9
32	31.4	06.2	92	90.2	18.0	152	149.1	29.7	212	207.9	41.4	272	266.7	53.1
33	32.4	06.4	93	91.2	18.1	153	150.0	29.9	213	208.9	41.6	273	267.7	53.3
34	33.3	06.6	94	92.2	18.3	154	151.0	30.0	214	209.9	41.8	274	268.7	53.5
35	34.3	06.8	95	93.2	18.5	155	152.0	30.2	215	210.8	42.0	275	269.7	53.7
36	35.3	07.0	96	94.1	18.7	156	153.0	30.4	216	211.8	42.1	276	270.7	53.9
37	36.3	07.2	97	95.1	18.9	157	154.0	30.6	217	212.8	42.5	277	271.6	54.0
38	37.3	07.4	98	96.1	19.1	158	154.0	30.8	218	213.8	42.6	278	272.6	54.2
39	38.2	07.6	99	97.1	19.3	159	155.9	31.0	219	214.8	42.7	279	273.6	54.4
40	39.2	07.8	100	98.1	19.5	160	156.9	31.2	220	215.7	42.9	280	274.6	54.6
41	40.2	08.0	101	99.1	19.7	161	157.9	31.4	221	216.7	43.1	281	275.6	54.8
42	41.2	08.2	102	100.0	19.9	162	158.9	31.6	222	217.7	43.3	282	276.5	55.0
43	42.2	08.4	103	101.0	20.1	163	159.8	31.8	223	218.7	43.5	283	277.5	55.2
44	43.2	08.6	104	102.0	20.3	164	160.8	32.0	224	219.7	43.7	284	278.5	55.4
45	44.1	08.8	105	103.0	20.5	165	161.8	32.2	225	220.6	43.9	285	279.5	55.6
46	45.1	09.0	106	104.0	20.7	166	162.8	32.4	226	221.6	44.1	286	280.5	55.8
47	46.1	09.2	107	104.9	20.9	167	163.8	32.6	127	222.6	44.3	287	281.4	56.0
48	47.1	09.4	108	105.9	21.1	168	164.7	32.8	228	223.6	44.5	288	282.4	56.2
49	48.1	09.6	109	106.9	21.3	169	165.7	33.0	229	224.6	44.7	289	283.4	56.4
50	49.0	09.8	110	107.9	21.5	170	166.7	33.2	230	225.6	44.9	260	284.4	56.6
51	50.0	10.0	111	108.9	21.7	171	167.7	33.4	231	226.5	45.1	261	285.4	56.8
52	51.0	10.1	112	109.8	21.9	172	168.7	33.6	232	227.5	45.3	262	286.4	57.0
53	52.0	10.4	113	110.8	22.0	173	169.7	33.8	233	228.5	45.5	263	287.3	57.2
54	53.0	10.5	114	111.8	22.2	174	170.6	34.0	234	229.5	45.7	264	288.3	57.3
55	53.9	10.7	115	112.8	22.4	175	171.6	34.1	235	230.5	45.9	265	289.3	57.6
56	54.9	10.9	116	113.8	22.6	176	172.6	34.3	236	231.4	46.0	256	290.3	57.8
57	55.9	11.1	117	114.7	22.8	177	173.6	34.5	237	232.4	46.2	297	291.3	58.0
58	56.9	11.3	118	115.7	23.0	178	174.6	34.7	238	233.4	46.4	298	292.2	58.1
59	57.9	11.5	119	116.7	23.2	179	175.5	34.9	239	234.4	46.6	299	293.2	58.3
60	58.8	11.7	120	117.7	23.4	180	176.5	35.1	240	235.4	46.8	300	294.2	58.5
Diſt.	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.

for 7 Points.

Difference of Latitude and Departure for 1¾ Point.

Dift.	Lat.	Dep.	Dift	Lat.	Dep.	Dift	Lat.	Dep.	Dift	Lat.	Dep.	Dift	Lat.	Dep.
1	01.0	00.2	61	59.2	14.8	121	117.4	29.4	181	175.6	44.0	241	233.8	58.6
2	01.9	00.5	62	60.1	15.1	122	118.3	29.6	182	176.5	44.2	242	234.7	58.8
3	02.9	00.7	63	61.1	15.3	123	119.3	29.9	183	177.5	44.5	243	235.7	59.0
4	03.9	01.0	64	62.1	15.6	124	120.3	30.1	184	178.5	44.7	244	236.7	59.3
5	04.9	01.2	65	63.1	15.8	125	121.3	30.4	185	179.5	45.0	245	237.7	59.5
6	05.8	03.5	66	64.0	16.0	122	122.2	30.6	186	180.4	45.2	246	238.6	59.8
7	06.8	01.7	67	65.0	16.3	127	123.2	30.9	187	181.4	45.4	247	239.6	60.0
8	07.8	01.9	68	66.0	16.5	128	124.2	31.1	188	182.4	45.7	248	240.6	60.3
9	08.7	02.2	69	66.9	16.8	129	125.1	31.3	189	183.3	45.9	249	241.5	60.5
10	09.7	02.4	70	67.9	17.0	130	126.1	31.6	190	184.3	46.2	250	242.5	60.7
11	10.7	02.7	71	68.9	17.3	131	127.1	31.8	191	185.3	46.4	251	243.5	61.0
12	11.6	02.9	72	69.8	17.5	132	128.0	31.1	192	186.2	46.7	252	244.4	61.2
13	12.6	03.2	73	70.8	17.7	133	129.0	32.3	193	187.2	46.9	253	245.4	61.5
14	13.6	03.4	74	71.8	18.0	134	130.0	32.6	194	188.2	47.1	254	246.4	61.7
15	14.6	03.6	75	72.8	18.2	135	131.0	32.8	195	189.2	47.4	255	247.4	62.0
16	15.5	03.9	76	73.7	18.5	136	131.9	33.0	196	190.1	47.6	256	248.3	62.2
17	16.5	04.1	77	74.7	18.7	137	132.9	33.3	197	191.1	47.9	257	249.3	62.5
18	17.5	04.4	78	75.7	19.0	138	133.9	33.5	198	192.1	48.1	258	250.3	62.7
19	18.4	04.6	79	76.6	19.2	139	134.8	33.8	199	193.0	48.4	259	251.2	62.9
20	19.4	04.9	80	77.6	19.4	140	135.8	34.0	100	194.0	48.6	260	252.2	63.2
21	20.4	05.1	81	78.6	19.7	141	136.8	34.3	101	195.0	48.8	261	253.2	63.4
22	21.3	05.3	82	79.5	19.9	142	137.7	34.5	102	195.9	49.1	262	254.1	63.7
23	22.3	05.6	83	80.5	20.2	143	138.7	34.7	103	196.9	49.3	263	255.1	63.9
24	23.3	05.8	84	81.5	20.4	144	139.7	35.0	104	197.9	49.6	264	256.1	64.2
25	24.3	06.1	85	82.5	20.7	145	140.7	35.2	105	198.9	49.8	265	257.1	64.4
26	25.2	06.3	86	83.4	20.9	146	141.6	35.5	106	199.8	50.1	266	258.0	64.6
27	26.2	06.6	87	84.4	21.1	147	142.6	35.7	107	200.8	50.3	267	259.0	64.9
28	27.2	06.8	88	85.4	21.4	148	143.6	36.0	108	201.8	50.5	268	260.0	65.1
29	28.1	07.0	89	86.3	21.6	149	144.5	36.2	109	202.7	50.8	269	260.9	65.4
30	29.1	07.3	90	87.3	21.9	150	145.5	36.5	110	203.7	51.0	270	261.9	65.6
31	30.1	07.5	91	88.3	22.1	151	146.5	36.7	211	204.7	51.3	271	262.9	65.9
32	31.0	07.8	92	89.2	22.4	152	147.4	36.9	212	205.6	51.5	272	263.8	66.1
33	32.0	08.0	93	90.2	22.6	153	148.4	37.2	213	206.6	51.8	273	264.8	66.3
34	33.0	08.3	94	91.2	22.8	154	149.4	37.4	214	207.6	52.0	274	265.8	66.6
35	34.0	08.5	95	92.2	23.1	155	150.4	37.7	215	208.6	52.2	275	266.8	66.8
36	34.9	08.7	96	93.1	23.3	156	151.3	37.9	216	209.5	52.5	276	267.7	67.1
37	35.9	09.0	97	94.1	23.6	157	152.3	38.2	217	210.5	52.7	277	268.7	67.3
38	36.9	09.2	98	95.1	23.8	158	153.3	38.4	218	211.5	53.0	278	269.7	67.6
39	37.8	09.5	99	96.0	24.1	159	154.2	38.6	219	212.4	53.2	279	270.6	67.8
40	38.8	09.7	100	97.0	24.3	160	155.2	38.9	220	213.4	53.5	280	271.6	68.0
41	39.8	10.0	101	98.0	24.5	161	156.2	39.1	221	214.4	53.7	281	272.6	68.3
42	40.7	10.2	102	98.9	24.8	162	157.1	39.4	222	215.3	53.9	282	273.5	68.5
43	41.7	10.4	103	99.9	25.0	163	158.1	39.6	223	216.3	54.2	283	274.5	68.8
44	42.7	10.7	104	100.9	25.3	164	159.1	39.9	224	217.3	54.4	284	275.5	69.0
45	43.7	10.9	105	101.9	25.5	165	160.1	40.1	225	218.3	54.7	285	276.5	69.3
46	44.6	11.2	106	102.8	25.8	166	161.0	40.3	226	219.2	54.9	286	277.4	69.5
47	45.6	11.4	107	103.8	26.0	167	162.0	40.6	227	220.2	55.2	287	278.4	69.7
48	46.6	11.7	108	104.8	26.2	168	163.0	40.8	228	221.2	55.4	288	279.4	70.0
49	47.5	11.9	109	105.7	26.5	169	163.9	41.1	229	222.1	55.6	289	280.3	70.2
50	48.5	12.2	110	106.7	26.7	170	164.9	41.3	230	223.1	55.9	290	281.3	70.5
51	49.5	12.4	111	107.7	27.0	171	165.9	41.6	231	224.1	56.1	291	282.3	70.7
52	50.4	12.6	112	108.6	27.2	172	166.8	41.8	232	225.0	56.4	292	283.2	71.0
53	51.4	12.9	113	109.6	27.5	173	167.8	42.0	233	226.0	56.6	293	284.2	71.2
54	52.4	13.1	114	110.6	27.7	174	168.8	42.3	234	227.0	56.9	294	285.2	71.4
55	53.4	13.4	115	111.6	27.9	175	169.8	42.5	235	228.0	57.1	295	286.2	71.7
56	54.3	13.6	116	112.5	28.2	176	170.7	42.8	236	228.9	57.3	296	287.1	71.9
57	55.3	13.9	117	113.5	28.4	177	171.7	43.0	237	229.9	57.6	297	288.1	72.2
58	56.3	14.1	118	114.5	28.7	178	172.7	43.3	238	230.9	57.8	298	289.1	72.4
59	57.2	14.3	119	115.4	28.9	179	173.6	43.5	239	231.8	58.1	299	290.0	72.7
60	58.2	14.6	120	116.4	29.2	180	174.6	43.7	240	232.8	58.3	300	291.0	72.9
Dift.	Dep.	Lat.	Dift	Dep.	Lat.	Dift	Dep.	Lat.	Dift	Dep.	Lat.	Dift	Dep.	Lat.

for 6¾ Points.

Difference of Latitude and Departure for 1½ Points.

Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.
1	01.0	00.3	61	58.4	17.7	121	215.8	35.1	181	173.2	52.5	241	230.6	69.9
2	01.9	00.6	62	59.3	18.0	122	116.8	35.4	182	174.2	52.8	242	231.6	70.2
3	02.9	00.9	63	60.3	18.3	123	117.7	35.7	183	175.1	53.1	243	232.5	70.5
4	03.8	01.2	64	61.2	18.6	124	118.7	36.0	184	176.1	53.4	244	233.5	70.8
5	04.8	01.5	65	62.2	18.9	125	119.6	36.3	185	177.0	53.7	245	234.5	71.0
6	05.7	01.7	66	63.2	19.1	126	120.6	36.5	186	178.0	53.9	246	235.4	71.3
7	06.7	02.0	67	64.1	19.4	127	121.5	36.8	187	179.0	54.2	247	236.4	71.6
8	07.7	02.3	68	65.1	19.7	128	122.5	37.1	188	179.9	54.5	248	237.3	71.9
9	08.6	02.6	69	66.0	20.0	129	123.5	37.4	189	180.9	54.8	249	238.3	72.2
10	09.6	02.9	70	67.0	20.3	130	124.4	37.7	190	181.8	55.1	250	239.2	72.5
11	10.5	03.2	71	67.9	20.6	131	125.4	38.0	191	182.8	55.4	251	240.2	72.8
12	11.5	03.5	72	68.8	20.9	132	126.3	38.3	192	183.7	55.7	252	241.2	73.1
13	12.4	03.8	73	69.9	21.2	133	127.3	38.6	193	184.7	56.0	253	242.1	73.4
14	13.4	04.1	74	70.8	21.5	134	128.2	38.9	194	185.7	56.3	254	243.1	73.7
15	14.4	04.4	75	71.8	21.8	135	129.2	39.2	195	186.6	56.6	255	244.0	74.0
16	15.3	04.6	76	72.7	22.0	136	130.2	39.4	196	187.6	56.8	256	245.0	74.2
17	16.3	04.9	77	73.7	22.3	137	131.1	39.7	197	188.5	57.1	257	245.9	74.5
18	17.2	05.2	78	74.6	22.6	148	132.1	40.0	198	189.2	57.4	258	246.9	74.8
19	18.2	05.5	79	75.6	22.9	139	133.0	40.3	199	190.4	56.7	259	247.9	75.1
20	19.1	05.8	80	76.6	23.2	140	134.0	40.6	200	191.4	58.0	260	248.8	75.4
21	20.1	06.1	81	77.5	23.5	141	134.9	40.9	201	192.4	58.3	261	249.8	75.7
22	21.1	06.4	82	78.5	23.8	142	135.9	41.2	202	193.3	58.6	262	250.7	76.9
23	22.0	06.7	83	79.4	24.1	143	136.9	41.5	203	194.3	58.9	263	251.7	76.3
24	23.0	07.0	84	80.4	24.4	144	137.8	41.8	204	195.2	59.2	264	252.6	76.6
25	23.9	07.3	85	81.3	24.7	145	138.8	42.1	205	196.2	59.5	265	253.6	76.9
26	24.9	07.5	86	82.3	24.9	146	139.7	42.3	206	197.1	59.7	266	254.6	77.1
27	25.8	07.8	87	83.3	25.2	147	140.7	42.6	207	198.1	60.0	267	255.5	77.4
28	26.8	08.1	88	84.2	25.5	148	141.6	42.9	208	199.1	60.3	268	256.5	77.7
29	27.8	08.4	89	85.2	25.8	149	142.6	43.2	209	200.0	60.6	269	257.4	78.0
30	28.7	08.7	90	86.1	26.1	150	143.5	43.5	210	201.0	60.9	270	258.4	78.3
31	29.7	09.0	91	87.1	26.4	151	144.5	43.8	211	201.9	61.2	271	259.3	78.6
32	30.6	09.3	92	88.0	26.7	152	145.5	44.1	212	202.9	61.5	272	260.3	78.9
33	31.6	09.6	93	89.0	27.0	153	146.4	44.4	213	203.8	61.8	273	261.3	79.2
34	32.5	09.9	94	90.0	27.3	154	147.4	44.7	214	204.8	62.1	274	262.2	79.5
35	33.5	10.2	95	90.9	27.6	155	148.3	45.0	215	205.8	62.4	275	263.2	79.8
36	34.5	10.4	96	91.9	27.8	156	149.3	45.2	216	206.7	62.6	276	264.1	80.0
37	35.4	10.7	97	92.8	28.1	157	150.2	45.5	217	207.7	62.9	277	265.1	80.3
38	36.4	11.0	98	93.8	28.4	158	151.2	45.8	218	208.6	63.2	278	266.0	80.6
39	37.3	11.3	99	94.7	28.7	159	152.2	46.2	219	209.6	63.1	279	267.0	80.9
40	38.3	11.6	100	95.7	29.0	160	153.1	46.4	220	210.5	63.8	280	268.0	81.2
41	39.2	11.9	101	96.7	29.5	161	154.1	46.7	221	211.5	64.1	281	268.9	81.5
42	40.2	12.2	102	97.6	29.6	162	155.0	47.0	222	212.5	64.4	282	269.9	81.8
43	41.2	12.5	103	98.6	29.9	163	156.0	47.3	223	213.4	64.7	283	270.8	82.1
44	42.1	12.8	104	99.5	30.2	164	156.9	47.6	224	214.4	65.0	284	271.8	82.4
45	43.1	13.1	105	100.5	30.5	165	157.9	47.9	225	215.3	65.3	285	272.7	82.7
46	44.0	13.3	106	101.4	30.7	166	158.9	48.1	226	216.3	65.5	286	273.7	82.9
47	45.0	13.6	107	102.4	31.0	167	159.8	48.4	227	217.2	65.8	287	274.7	83.2
48	45.9	13.9	108	103.4	31.3	168	160.8	48.7	228	218.2	66.1	288	275.6	83.5
49	46.9	14.2	109	104.3	31.6	169	161.7	49.0	229	219.2	66.4	289	276.6	83.8
50	47.9	14.5	110	105.3	31.9	170	162.7	49.3	230	210.1	66.7	290	277.5	84.1
51	48.8	14.8	111	106.2	32.2	171	163.6	49.6	231	221.1	67.0	291	278.5	84.4
52	49.8	15.1	112	107.2	32.5	172	164.6	49.9	232	222.0	67.3	292	279.4	84.7
53	50.7	15.4	113	108.1	32.8	173	165.6	50.2	233	223.0	67.6	293	280.4	85.0
54	51.7	15.7	114	109.1	33.1	174	166.5	50.5	234	223.9	67.9	294	281.4	85.3
55	52.6	16.0	115	110.1	33.4	175	167.5	50.8	235	224.9	68.2	295	282.3	85.6
56	53.6	16.2	116	111.0	33.6	176	168.4	51.0	236	225.9	68.4	296	283.3	85.8
57	54.5	16.5	117	112.0	33.9	177	169.4	51.3	237	226.8	68.7	297	284.2	86.1
58	55.5	16.8	118	112.9	34.2	178	170.3	51.6	238	227.8	69.0	298	285.2	86.4
59	56.5	17.1	119	113.9	34.5	179	171.3	51.9	239	228.7	69.3	299	286.1	86.7
60	57.4	17.4	120	114.8	34.8	180	172.3	52.2	240	229.7	69.6	300	287.1	87.0
Diſt.	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.

for 6½ Points.

Difference of Latitude and Departure for 1¾ Point.

Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.
1	00.9	00.3	61	57.4	20.5	121	113.9	40.8	181	170.4	61.0	241	226.9	81.2
2	01.9	00.7	62	58.4	20.9	122	114.9	41.1	182	171.4	61.3	242	227.8	81.5
3	02.8	01.0	63	59.3	21.2	123	115.8	41.4	183	172.3	61.6	243	228.8	81.8
4	03.8	01.3	64	60.3	21.6	124	116.7	41.8	184	173.2	62.0	244	229.7	82.2
5	04.7	01.7	65	61.2	21.9	125	117.7	42.1	185	174.2	62.3	245	230.7	82.5
6	05.6	02.0	66	62.1	22.2	122	118.6	42.4	186	175.1	62.6	246	231.6	82.9
7	06.6	02.4	67	63.1	22.6	127	119.6	42.8	187	176.1	63.0	247	232.5	83.2
8	07.5	02.7	68	64.0	22.9	128	120.5	43.1	188	177.0	63.3	248	233.5	83.5
9	08.5	03.0	69	65.0	23.2	129	121.5	43.4	189	177.9	63.7	249	234.4	83.9
10	09.4	03.4	70	65.9	23.6	130	122.4	43.8	190	178.9	64.0	250	235.4	84.2
11	10.4	03.7	71	67.8	23.9	131	123.3	44.1	191	179.8	64.3	251	236.3	84.5
12	11.3	04.0	72	68.8	24.2	132	124.3	44.5	192	180.8	64.7	252	237.3	84.9
13	12.2	04.4	73	69.8	24.6	133	125.2	44.8	193	181.7	65.6	253	238.2	85.2
14	13.2	04.7	74	60.7	24.9	134	126.2	45.1	194	182.6	65.3	254	239.1	85.5
15	14.1	05.1	75	70.6	25.3	135	127.1	45.5	195	183.6	65.7	255	240.1	85.9
16	15.1	05.4	76	71.6	25.6	136	128.0	45.8	196	184.5	66.0	256	241.0	86.2
17	16.0	05.7	77	72.5	25.9	137	129.0	46.1	197	185.5	66.3	257	242.0	86.6
18	17.0	06.1	78	73.4	26.3	138	129.9	46.5	198	186.4	66.7	258	242.9	86.9
19	17.9	06.4	79	74.4	26.6	139	130.9	46.8	199	187.4	67.0	259	243.8	87.2
20	18.8	06.7	80	75.3	26.1	140	131.8	47.2	100	188.3	67.4	260	244.8	87.6
21	19.8	07.1	81	76.3	27.3	141	132.8	47.5	101	189.2	67.7	261	245.7	87.9
22	20.7	07.4	82	77.2	27.6	142	133.7	47.8	102	190.2	68.0	262	246.7	88.2
23	21.7	07.7	83	78.1	28.0	143	134.6	48.2	103	191.1	68.4	263	247.6	88.6
24	22.6	08.1	84	79.1	28.3	144	135.6	48.5	104	192.1	68.7	264	248.6	88.9
25	23.5	08.4	85	80.0	28.6	145	136.5	48.8	105	193.0	69.0	265	249.5	89.2
26	24.5	08.8	86	81.0	29.0	146	137.5	49.2	106	194.0	69.4	266	250.4	89.6
27	25.4	09.1	87	81.9	29.3	147	138.4	49.5	107	194.9	69.7	267	251.4	89.9
28	26.4	09.4	88	82.8	29.6	148	139.3	49.8	108	195.8	70.1	268	252.3	90.3
29	27.3	09.8	89	83.8	30.0	149	140.3	50.2	109	196.8	70.4	269	253.3	90.6
30	28.2	10.1	90	84.7	30.3	150	141.2	50.5	110	197.7	70.7	270	254.2	90.9
31	29.2	10.4	91	85.7	30.6	151	142.2	50.9	211	198.7	71.1	271	255.1	91.3
32	30.1	10.8	92	86.6	31.0	152	143.1	51.2	212	199.6	71.4	272	256.1	91.6
33	31.1	11.1	93	87.6	31.3	153	144.0	51.5	213	200.5	71.7	273	257.0	91.0
34	32.0	11.5	94	88.5	31.7	154	145.0	51.9	214	201.5	72.1	274	258.0	92.3
35	33.0	11.8	95	89.4	32.0	155	145.9	52.2	215	202.4	72.4	275	258.9	92.6
36	33.9	12.1	96	90.4	32.3	156	146.6	52.5	216	203.4	72.7	276	259.9	93.0
37	34.8	12.5	97	91.3	32.7	157	147.8	52.9	217	204.3	73.1	277	260.8	93.3
38	35.8	12.8	98	92.3	33.0	158	148.8	53.2	218	205.2	73.4	278	261.7	93.6
39	36.7	13.1	99	93.2	33.3	159	149.7	53.6	219	206.3	73.8	279	262.7	94.0
40	37.7	13.5	100	194.2	33.7	160	150.6	53.9	220	207.1	74.1	280	263.6	94.3
41	38.6	13.8	101	195.1	34.0	161	151.6	54.2	221	208.1	74.4	281	264.6	94.6
42	39.5	14.1	102	196.0	34.4	162	152.5	54.6	222	209.0	74.8	282	265.5	95.0
43	40.5	14.5	103	197.0	34.7	163	153.5	54.9	223	210.0	75.1	283	266.4	95.3
44	41.4	14.8	104	197.9	35.4	164	154.4	55.2	224	210.9	75.4	284	267.4	95.6
45	42.4	15.2	105	198.9	35.4	165	155.3	55.6	225	211.8	75.8	285	268.3	96.0
46	43.3	15.5	106	199.7	35.7	166	156.3	55.9	226	212.8	76.1	286	269.3	96.3
47	44.3	15.8	107	100.8	36.0	167	157.2	56.2	227	213.7	76.5	287	270.2	96.7
48	45.2	16.2	108	101.7	36.4	168	158.2	56.6	228	214.7	76.8	288	271.2	97.0
49	46.1	16.5	109	102.7	36.7	169	159.1	56.9	229	215.6	77.1	289	272.1	97.3
50	47.1	16.8	110	103.6	37.0	170	160.1	57.3	230	216.5	77.5	290	273.0	97.7
51	48.0	17.2	111	104.5	37.4	171	161.0	57.6	231	217.5	77.8	291	274.0	98.0
52	49.0	17.5	112	105.4	37.7	172	161.9	57.9	232	218.4	78.1	292	274.9	98.3
53	49.9	17.9	113	106.4	38.1	173	162.9	58.4	233	219.4	78.5	293	275.9	98.7
54	50.8	18.2	114	107.3	38.4	174	163.8	58.6	234	220.3	78.8	294	276.8	99.0
55	51.8	18.5	115	108.3	38.7	175	164.8	58.9	235	221.3	79.1	295	277.7	99.4
56	52.7	18.9	116	109.2	39.1	176	165.7	59.5	236	222.2	79.5	296	278.7	99.7
57	53.7	19.2	117	110.2	39.4	177	166.6	59.6	237	223.1	79.8	297	279.6	100.0
58	54.6	19.5	118	111.1	39.7	178	167.6	60.0	238	224.1	70.2	298	280.6	100.4
59	55.5	19.9	119	112.0	40.1	179	168.5	60.3	239	225.0	70.5	299	281.5	100.7
60	56.5	20.2	120	113.0	40.4	180	169.5	60.6	240	226.0	70.8	300	282.5	101.0
Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.

for 6¼ Points.

Difference of Latitude and Departure for 2 Point.

Diſt.	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep	Diſt	Lat.	Dep.
1	00.9	00.4	61	56.4	23.3	121	111.8	46.3	181	167.2	69.3	241	222.7	92.2
2	01.8	00.8	62	57.3	23.7	122	112.7	46.7	182	168.2	69.7	242	223.6	92.6
3	02.8	01.1	6	58.2	24.1	123	113.6	47.1	183	169.1	70.0	243	224.5	93.0
4	03.7	01.5	64	59.1	24.5	124	114.6	47.5	184	170.0	70.4	244	225.4	93.4
5	04.6	01.9	65	60.1	24.9	125	115.5	47.8	185	170.9	70.8	245	226.4	93.8
6	05.5	02.3	66	61.0	25.3	126	116.4	48.2	186	171.9	71.2	246	227.3	94.1
7	06.5	01.7	67	61.9	25.6	127	117.3	48.6	187	172.8	71.6	247	228.2	94.5
8	07.4	03.1	68	62.8	26.0	128	118.3	49.0	188	173.7	72.0	248	229.1	94.9
9	08.3	03.4	69	63.8	26.4	129	119.2	49.4	189	174.6	72.3	249	230.1	95.3
10	09.2	03.8	70	64.7	26.8	130	120.1	49.8	190	175.6	72.7	250	231.0	95.7
11	10.2	04.2	71	65.6	27.2	131	121.0	50.1	191	176.5	73.1	251	231.9	96.1
12	11.1	04.6	72	66.5	27.6	132	122.0	50.5	192	177.4	73.5	252	232.8	96.4
13	12.0	05.0	73	67.5	27.9	133	122.9	50.9	193	178.3	73.9	253	233.8	96.8
14	12.9	05.4	74	68.4	28.3	134	123.8	51.3	194	179.2	74.2	254	234.7	97.2
15	13.9	05.7	75	69.3	28.7	135	124.7	51.7	195	180.2	74.6	255	235.6	97.6
16	14.8	06.1	76	70.2	29.1	136	125.7	52.0	196	181.1	75.0	256	236.5	98.0
17	15.7	06.5	77	71.1	29.5	137	126.6	52.4	197	182.0	75.4	257	237.5	98.4
18	16.6	06.9	78	72.1	29.9	138	127.5	52.8	198	182.9	75.8	258	238.4	98.7
19	17.6	07.3	79	73.0	30.2	139	128.4	53.2	199	183.9	76.2	259	239.3	99.1
20	18.5	07.7	80	73.9	30.6	140	129.4	53.6	200	184.8	76.1	260	240.2	99.5
21	19.4	08.0	81	74.8	31.0	141	130.3	54.0	201	185.7	76.9	261	241.1	99.9
22	20.3	08.4	82	75.8	31.4	142	131.2	54.3	202	186.6	77.3	262	242.1	100.3
23	21.3	08.8	83	76.7	31.8	143	132.1	54.7	203	187.6	77.7	263	243.0	100.7
24	22.2	09.2	84	77.6	32.1	144	133.0	55.1	204	188.5	78.1	264	243.9	101.0
25	23.1	09.6	85	78.5	32.5	145	134.0	55.5	205	189.4	78.5	265	244.8	101.4
26	24.0	10.0	86	79.5	32.9	146	134.9	55.9	206	190.3	78.8	266	245.8	101.8
27	24.9	10.3	87	80.4	33.3	147	135.8	56.3	207	191.3	79.2	267	246.7	102.2
28	25.9	10.7	88	81.3	33.7	148	136.7	56.6	208	192.2	79.6	268	247.6	102.6
29	26.8	11.1	89	82.2	34.1	149	137.7	57.0	209	193.1	80.0	269	248.5	103.0
30	27.7	11.5	90	83.2	34.4	150	138.6	57.4	210	194.0	80.4	270	249.5	103.3
31	28.6	11.9	91	84.1	34.8	151	139.5	57.8	211	194.9	80.8	271	250.4	103.7
32	29.6	12.2	92	85.0	35.2	152	140.4	58.2	212	195.9	81.1	272	251.3	104.1
33	30.5	12.6	93	85.9	35.6	153	141.4	58.6	213	196.8	81.5	273	252.2	104.5
34	31.4	13.0	94	86.9	36.0	154	142.3	58.9	214	197.7	81.9	274	253.2	104.9
35	32.3	13.4	95	87.8	36.4	155	143.2	59.3	215	198.6	82.3	275	254.1	105.2
36	33.3	13.8	96	88.7	36.7	156	144.1	59.7	216	199.6	82.7	276	255.0	105.6
37	34.2	14.2	97	89.6	37.1	157	145.2	60.1	217	200.5	83.0	277	255.9	106.0
38	35.1	14.5	98	90.6	37.5	158	146.0	60.5	218	201.4	83.4	278	256.9	106.4
39	36.0	14.9	99	91.5	37.9	159	146.9	60.9	219	202.3	83.8	279	257.8	106.8
40	37.0	15.3	100	92.4	38.3	160	147.8	61.2	220	203.3	84.2	280	258.7	107.2
41	37.9	15.7	101	93.3	38.7	161	148.8	61.6	221	204.2	84.6	281	259.6	107.5
42	38.8	16.1	102	94.2	39.0	162	149.7	62.0	222	205.1	85.0	282	260.6	107.9
43	39.7	16.5	103	95.1	39.4	163	150.6	62.4	223	206.0	85.3	283	261.5	108.3
44	40.6	16.8	104	96.1	39.8	164	151.5	62.8	224	207.0	85.7	284	262.4	108.7
45	41.6	17.2	105	97.0	40.2	165	152.5	63.1	225	207.9	86.1	285	263.3	109.1
46	42.5	17.6	106	97.9	40.6	166	153.4	63.5	226	208.8	86.5	286	264.2	109.5
47	43.4	18.0	107	98.9	41.0	167	154.3	63.9	227	209.7	86.9	287	265.2	109.8
48	44.4	18.4	108	99.8	41.3	168	155.2	64.3	228	210.7	87.3	288	266.1	110.2
49	45.3	18.8	109	100.7	41.7	169	156.1	64.7	229	211.6	87.6	289	267.0	110.6
50	46.2	19.1	110	101.6	42.1	170	157.1	65.1	230	212.5	88.0	290	267.9	111.0
51	47.1	19.5	111	102.6	42.3	171	158.0	65.4	231	213.4	88.4	291	268.9	111.4
52	48.0	19.9	112	103.5	42.9	172	158.9	65.8	232	214.4	88.8	292	269.8	111.8
53	49.0	20.3	113	104.4	43.2	173	159.8	66.2	233	215.3	89.2	293	270.7	112.1
54	49.9	20.7	114	105.3	43.6	174	160.8	66.6	234	216.2	89.6	294	271.6	112.5
55	50.8	21.0	115	106.3	44.0	175	161.7	67.0	235	217.1	89.9	295	272.6	112.9
56	51.7	21.4	116	107.1	44.4	176	162.6	67.4	236	218.0	90.3	296	273.5	113.3
57	52.7	21.8	117	108.2	44.8	177	163.5	67.7	237	219.0	90.7	297	274.4	113.7
58	53.6	22.2	118	109.0	45.2	178	164.5	68.1	238	219.9	91.1	298	275.3	114.0
59	54.5	22.6	119	109.9	45.5	179	165.4	68.5	239	220.8	91.5	299	276.3	114.4
60	55.4	23.0	120	110.9	45.9	180	166.3	68.9	240	221.7	91.9	300	277.2	114.8
Diſt.	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.

for 6 Points.

Difference of Latitude and Departure for 2¼ Point.

Dift.	Lat.	Dep.	Dift	Lat.	Dep.	Dift	Lat.	Dep.	Dift	Lat.	Dep.	Dift	Lat.	Dep.
1	00.9	00.4	61	55.1	26.1	121	199.4	51.7	181	163.6	77.4	241	217.8	103.0
2	01.8	00.9	62	56.0	26.5	122	110.3	52.2	182	164.5	77.8	242	218.7	108.5
3	02.7	01.3	63	57.0	26.9	123	111.2	52.6	183	165.4	78.2	243	219.6	103.9
4	03.6	01.7	64	57.9	27.4	124	112.1	53.0	184	166.3	78.7	244	220.5	104.3
5	04.5	02.1	65	58.8	27.8	125	113.0	53.5	185	167.2	79.1	245	221.4	104.8
6	05.4	02.6	66	59.7	28.2	126	113.9	53.9	186	168.1	79.5	246	222.4	105.2
7	06.3	03.0	67	60.6	28.6	127	114.8	54.3	187	169.0	80.0	247	223.3	105.6
8	07.2	03.4	68	61.5	29.1	128	115.7	54.7	188	169.9	80.4	248	224.2	106.0
9	08.1	03.8	69	62.4	29.5	129	116.6	55.2	189	170.8	80.8	249	225.1	106.5
10	09.0	04.3	70	63.3	29.9	130	117.5	55.6	190	171.7	81.2	250	226.0	106.9
11	09.9	04.7	71	64.2	30.4	131	118.4	56.0	191	172.6	81.7	251	226.9	107.3
12	10.8	05.1	72	65.1	30.8	132	119.3	56.4	192	173.6	82.1	252	227.8	107.8
13	11.8	05.6	73	66.0	31.2	133	120.2	56.9	193	174.5	82.5	253	228.7	108.2
14	12.7	06.0	74	66.9	31.6	134	121.1	57.2	194	175.4	83.0	254	229.6	108.6
15	13.6	06.4	75	67.8	32.1	135	122.0	57.7	195	176.3	83.4	255	230.5	109.0
16	14.5	06.8	76	68.7	32.5	136	122.9	58.2	196	177.2	83.8	256	231.4	109.5
17	15.4	07.3	77	69.6	32.9	137	123.8	58.6	197	178.1	84.2	257	232.3	109.9
18	16.3	07.7	78	70.5	33.4	138	124.7	59.0	198	179.0	84.7	258	233.2	110.3
19	17.2	08.1	79	71.4	33.8	139	125.6	59.4	199	179.9	85.1	259	234.1	110.7
20	18.1	08.6	80	72.3	34.2	140	126.5	59.9	200	180.8	85.5	260	235.0	111.2
21	19.0	09.0	81	73.2	34.6	141	127.4	60.3	201	181.7	85.9	261	235.9	111.6
22	19.9	09.4	82	74.1	35.1	142	128.4	60.7	202	182.6	86.4	262	236.8	112.0
23	20.8	09.8	83	75.0	35.5	143	129.3	61.1	203	183.5	86.8	263	237.7	112.5
24	21.7	10.3	84	75.9	35.9	144	130.2	61.6	204	184.4	87.2	264	238.6	112.9
25	22.6	10.7	85	76.8	36.3	145	131.1	62.0	205	185.3	87.7	265	239.5	113.3
26	23.5	11.1	86	77.7	36.8	146	132.0	62.4	206	186.2	88.1	266	240.4	113.7
27	24.4	11.5	87	78.6	37.2	147	132.9	62.9	207	187.1	88.5	267	241.3	114.2
28	25.3	12.0	88	79.6	37.6	148	133.8	63.3	208	188.0	88.9	268	242.2	114.6
29	26.2	12.4	89	80.5	38.1	149	134.7	63.7	209	188.9	89.4	269	243.1	115.0
30	27.1	12.8	90	81.4	38.5	150	135.6	64.1	210	189.8	89.8	270	244.0	115.5
31	28.0	13.3	91	82.3	38.9	151	136.5	64.6	211	190.7	90.2	271	245.0	115.9
32	28.9	13.7	92	83.2	39.3	152	137.4	65.0	212	191.6	90.6	272	245.9	116.3
33	29.8	14.1	93	84.1	39.8	153	138.3	65.4	213	192.5	91.1	273	246.8	116.7
34	30.7	14.5	94	85.0	40.2	154	139.2	65.8	214	193.4	91.5	274	247.7	117.2
35	31.6	15.0	95	85.9	40.6	155	140.1	66.3	215	194.3	91.9	275	248.6	117.6
36	32.5	15.4	96	86.8	41.0	156	141.0	66.7	216	195.2	92.4	276	249.5	118.0
37	33.4	15.8	97	87.7	41.5	157	141.9	67.1	217	196.1	92.8	277	250.4	118.4
38	34.4	16.2	98	88.6	41.9	158	142.8	67.6	218	197.0	93.2	278	251.3	118.9
39	35.3	16.7	99	89.5	42.3	159	143.7	68.0	219	197.9	93.6	279	252.2	119.3
40	36.2	17.1	100	90.4	42.8	160	144.6	68.4	220	198.8	94.1	280	253.1	119.7
41	37.1	17.5	101	91.3	43.2	161	145.5	68.8	221	199.8	94.5	281	254.0	120.2
42	38.0	18.0	102	92.2	43.6	162	146.4	69.3	222	200.7	94.9	282	254.9	120.6
43	38.9	18.4	103	93.1	44.0	163	147.3	69.7	223	201.6	95.4	283	255.8	121.0
44	39.8	18.8	104	94.0	44.5	164	148.2	70.1	224	202.5	95.8	284	256.7	121.4
45	40.7	19.2	105	94.9	44.9	165	149.1	70.6	225	203.4	96.2	285	257.6	121.9
46	41.6	19.1	106	95.8	45.3	166	150.0	71.0	226	204.3	96.6	286	258.5	122.3
47	42.5	20.7	107	96.7	45.8	167	151.0	71.4	227	205.2	97.1	287	259.4	122.7
48	43.4	20.5	108	97.6	45.2	168	151.9	71.8	228	206.1	97.5	288	260.3	123.1
49	44.3	21.0	109	98.5	46.6	169	152.8	72.3	229	207.0	97.9	289	261.2	123.6
50	45.2	21.4	110	99.4	46.9	170	153.7	72.7	230	207.0	98.3	290	262.1	124.0
51	46.1	21.8	111	100.3	47.5	171	154.6	73.1	231	208.8	98.8	291	263.0	124.4
52	47.0	22.2	112	101.2	47.9	172	155.5	73.5	232	209.7	99.1	292	263.9	124.9
53	47.9	22.7	113	102.1	48.3	173	156.4	74.0	233	210.6	99.6	293	264.8	125.3
54	48.8	23.1	114	103.0	48.7	174	157.3	74.4	234	211.5	100.1	294	265.7	125.7
55	49.7	23.5	115	103.9	49.2	175	158.2	74.8	235	212.4	100.5	295	266.6	126.1
56	50.6	23.9	116	104.8	49.6	176	159.1	75.3	236	213.3	100.9	296	267.6	126.6
57	51.5	24.4	117	105.8	50.0	177	160.0	75.7	237	214.2	101.3	297	268.5	127.0
58	52.4	24.8	118	106.7	50.5	178	160.9	76.1	238	215.1	101.8	298	269.4	127.4
59	53.3	25.2	119	107.6	50.9	179	161.8	76.5	239	216.0	102.2	299	270.3	127.8
60	54.2	25.7	120	108.5	51.3	180	162.7	77.0	240	216.9	102.6	300	271.2	128.3
Dift.	Dep.	Lat.	Dift	Dep.	Lat.	Dift	Dep.	Lat.	Dift	Dep.	Lat.	Dift	Dep.	Lat.

For 5 ¾ Points.

Difference of Latitude and Departure for 2½ Points.

Dist.	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.9	00.5	61	53.8	28.7	121	106.7	57.0	181	159.6	85.3	241	212.6	113.5
2	01.8	00.9	62	54.7	29.2	122	107.6	57.5	182	160.5	85.8	242	213.4	114.0
3	02.6	01.4	63	55.6	29.7	123	108.5	58.0	183	161.4	86.2	243	214.3	114.5
4	03.5	01.9	64	56.4	30.2	124	109.4	58.4	184	162.3	86.7	244	215.2	115.0
5	04.4	02.4	65	57.3	30.6	125	110.3	58.9	185	163.2	87.2	245	216.1	115.4
6	05.3	02.8	66	58.2	31.1	126	111.1	59.4	186	164.1	87.6	246	217.0	115.9
7	06.2	03.3	67	59.1	31.6	127	112.0	59.8	187	164.9	88.1	247	217.9	116.4
8	07.1	03.8	68	60.0	32.0	128	112.9	60.3	188	165.8	88.6	248	218.7	116.8
9	07.9	04.2	69	60.9	32.5	129	113.8	60.8	189	166.7	89.1	249	219.6	117.3
10	08.8	04.7	70	61.7	33.0	130	114.7	61.3	190	167.6	89.5	250	220.5	117.8
11	09.7	05.2	71	62.6	33.5	131	115.5	61.7	191	168.5	90.0	251	221.4	118.3
12	10.6	05.7	72	63.5	33.9	132	116.4	62.2	192	169.3	90.5	252	222.3	118.7
13	11.5	06.1	73	64.4	34.4	133	117.3	62.7	193	170.2	90.9	253	223.1	119.2
14	12.3	06.6	74	65.3	34.9	134	118.2	63.2	194	171.1	91.4	254	224.0	119.7
15	13.2	07.1	75	66.2	35.3	135	119.1	63.6	195	172.0	91.9	255	224.9	120.1
16	14.2	07.5	76	67.0	35.8	136	120.0	64.1	196	172.9	92.4	256	225.8	120.6
17	15.0	08.0	77	67.9	36.3	137	120.8	64.5	197	173.8	92.8	257	226.7	121.1
18	15.9	08.5	78	68.8	36.8	138	121.7	65.0	198	174.6	93.3	258	227.6	121.6
19	16.8	09.0	79	69.7	37.2	139	122.6	65.5	199	175.5	93.8	259	228.4	122.0
20	17.6	09.4	80	70.6	37.7	140	123.5	66.0	200	176.4	94.2	260	229.3	122.5
21	18.5	09.9	81	71.4	38.2	141	124.4	66.4	201	177.3	94.7	261	230.2	123.0
22	19.4	10.4	82	72.3	38.6	142	125.2	66.9	202	178.2	95.2	262	231.1	123.4
23	20.3	10.8	83	73.2	39.1	143	126.1	67.4	203	179.0	95.6	263	232.0	123.9
24	21.2	11.3	84	74.1	39.6	144	127.0	67.8	204	179.9	96.1	264	232.8	124.4
25	22.1	11.8	85	75.0	40.1	145	127.9	68.3	205	180.8	96.6	265	233.7	124.9
26	22.9	12.3	86	75.9	40.5	146	128.8	68.8	206	181.7	97.1	266	234.6	125.3
27	23.8	12.7	87	76.7	41.0	147	129.6	69.3	207	182.6	97.5	267	235.5	125.8
28	24.7	13.2	88	77.6	41.5	148	130.5	69.7	208	183.5	98.0	268	236.4	126.3
29	25.6	13.7	89	78.5	41.9	149	131.4	70.2	209	184.3	98.5	269	237.3	126.7
30	26.5	14.1	90	79.4	42.4	150	132.3	70.7	210	185.2	98.9	270	238.1	127.2
31	27.3	14.6	91	80.3	42.8	151	133.2	71.1	211	186.1	99.4	271	239.0	127.7
32	28.2	15.1	92	81.1	43.4	152	134.1	71.6	212	187.0	99.9	272	239.9	128.2
33	29.1	15.5	93	82.0	43.8	153	134.9	72.1	213	187.9	100.4	273	240.8	128.6
34	30.0	16.0	94	82.9	44.3	154	135.8	72.6	214	188.7	100.8	274	241.7	129.1
35	30.9	16.5	95	83.8	44.4	155	136.7	73.0	215	189.6	101.3	275	242.5	129.6
36	31.8	17.0	96	84.7	45.2	156	137.6	73.5	216	190.5	101.8	276	243.4	130.0
37	32.6	17.4	97	85.6	45.7	157	138.5	74.0	217	191.4	102.2	277	244.3	130.5
38	33.5	17.9	98	86.4	46.2	158	139.4	74.4	218	192.3	102.7	278	245.2	131.0
39	34.4	18.4	99	87.3	46.6	159	140.2	74.9	219	193.2	103.2	279	246.1	131.5
40	35.3	18.8	100	88.2	47.1	160	141.1	75.4	220	194.0	103.7	280	247.0	131.9
41	36.2	19.3	101	89.1	47.6	161	142.0	75.9	221	194.9	104.1	281	247.8	132.4
42	37.0	19.8	102	90.0	48.1	162	142.9	76.3	222	195.8	104.6	282	248.7	132.9
43	37.9	10,3	103	90.8	48.5	163	143.8	76.8	223	196.7	105.1	283	249.6	133.3
44	38.8	10.7	104	91.7	49.0	164	144.6	77.3	224	197.6	105.5	284	250.5	133.8
45	39.7	11.2	105	92.6	49.5	165	145.5	77.7	225	198.4	106.0	285	251.4	134.3
46	40.6	11.7	106	93.5	49.9	166	146.4	78.2	226	199.3	106.5	285	252.3	134.8
47	41.5	12,1	107	94.4	50.4	167	147.3	78.7	227	200.2	107.0	287	253.1	135.2
48	42.3	12.6	108	95.3	50.9	168	148.2	79.2	228	201.1	107.4	288	254.0	135.7
49	43.2	13.1	109	96.1	51.4	169	149.1	79.6	229	202.0	107.9	289	254.9	136.2
50	44.1	13.6	110	97.0	51.8	170	149.9	80.1	230	202.9	108.4	290	255.8	136.6
51	45.0	14.0	111	97.9	52.3	171	150.8	80.6	231	203.7	108.8	291	256.7	137.1
52	45.9	14.5	112	98.8	52.8	172	151.7	81.0	232	204.6	109.3	292	257.5	137.6
53	46.7	15.0	113	99.7	53.2	173	152.6	81.5	233	205.5	109.8	293	258.4	138.1
54	47.6	15.4	114	100.5	53.7	174	153.5	82.0	234	206.4	110.3	294	259.3	138.5
55	48.5	15.9	115	101.4	54.2	175	154.3	82.5	235	207.3	110.7	295	260.2	139.0
56	49.4	16.4	116	102.3	54.7	176	155.2	82.9	236	208.2	111.2	296	261.1	139.5
57	50.3	16.9	117	103.2	55.1	177	156.1	83.4	237	209.0	111.7	297	262.0	139.9
58	51.2	17.3	118	104.1	55.6	178	157.0	83.9	238	209.9	112.1	298	262.8	140.4
59	52.0	17.8	119	105.0	56.1	179	157,9	84.3	239	210.8	112.6	299	263.7	140.9
60	52.9	18.3	120	105.8	56.5	180	158.8	84.8	240	211.7	113.1	300	264.6	141.4
Dist.	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep	Lat.

for 5½ Points.

Difference of Latitude and Departure for 2¾ Point.

Dift.	Lat.	Dep.	Dift	Lat.	Dep.	Dift	Lat.	Dep.	Dift	Lat.	Dep.	Dift	Lat.	Dep.
1	00.9	00.6	61	52.3	31.4	121	103.8	62.2	181	155.2	93.0	241	206.7	123.9
2	01.7	01.0	62	53.2	31.9	122	104.6	62.7	182	156.1	93.5	242	207.6	124.4
3	02.6	01.5	63	54.0	32.4	123	105.5	63.2	183	157.0	94.0	243	208.4	124.9
4	03.4	02.1	64	54.9	32.9	124	106.4	63.7	184	157.8	94.6	244	209.3	125.4
5	04.3	02.6	65	55.8	33.4	125	107.2	64.2	185	158.7	95.1	245	210.1	125.9
6	05.1	03.1	66	56.6	33.9	126	108.1	64.8	186	159.5	95.6	246	211.0	126.4
7	06.0	03.6	67	57.5	34.4	127	108.9	65.3	187	160.4	96.1	247	211.9	126.9
8	06.9	04.1	68	58.3	35.0	128	109.8	65.8	188	161.2	96.6	248	212.7	127.4
9	07.7	04.6	69	59.2	35.5	129	110.6	66.3	189	162.1	97.1	249	213.6	128.0
10	08.6	05.1	70	60.0	36.0	130	111.5	66.8	190	163.0	97.6	250	214.4	128.5
11	09.4	05.7	71	60.9	36.5	131	112.4	67.3	191	163.8	98.2	251	215.3	129.9
12	10.3	06.2	72	61.8	37.0	132	113.2	67.8	192	164.7	98.7	252	216.1	129.5
13	11.2	06.7	73	62.6	37.6	133	114.1	68.4	193	165.5	99.2	253	217.0	130.0
14	12.0	07.2	74	63.5	38.0	134	114.9	68.9	194	166.4	99.7	254	217.9	130.5
15	12.5	07.7	75	64.3	38.6	135	115.8	69.4	195	167.3	100.2	255	218.7	131.0
16	13.7	08.2	76	65.2	39.1	136	116.6	69.9	196	168.1	100.7	256	219.6	131.1
17	14.6	08.7	77	66.0	39.6	137	117.5	70.4	197	169.0	101.2	257	220.4	132.1
18	15.4	09.3	78	66.9	40.1	138	118.4	70.9	198	169.8	101.8	258	221.3	132.6
19	16.3	09.8	79	67.8	40.6	139	119.2	71.4	199	170.7	102.3	259	222.1	133.1
20	17.2	10.3	80	68.6	41.1	140	120.1	72.0	200	171.5	102.8	260	223.0	133.6
21	18.0	10.8	81	69.5	41.6	141	120.9	72.5	201	172.4	103.3	261	223.9	134.1
22	18.9	11.3	82	70.3	42.2	142	121.8	73.0	202	173.3	103.8	262	224.7	134.6
23	19.7	11.8	83	71.2	42.7	143	122.7	73.5	203	174.1	104.3	263	225.6	135.2
24	20.6	12.3	84	72.0	43.2	144	123.5	74.0	204	175.0	104.8	264	226.4	135.7
25	21.4	12.9	85	72.9	43.7	145	124.4	74.6	205	175.8	105.4	265	227.3	136.2
26	22.3	13.4	86	73.8	44.2	146	125.2	75.0	206	176.7	105.9	266	228.1	136.7
27	23.2	13.9	87	74.6	44.7	147	126.1	75.6	207	177.5	106.4	267	229.0	137.2
28	24.0	14.4	88	75.5	45.2	148	126.9	76.1	208	178.4	106.9	268	229.9	137.7
29	24.9	14.9	89	76.3	45.7	149	127.8	76.6	209	179.3	107.4	269	230.7	138.2
30	25.7	15.4	90	77.2	46.3	150	128.7	77.1	210	180.1	107.9	270	231.6	138.8
31	26.6	15.9	91	78.1	46.8	151	129.5	77.6	211	181.0	108.4	271	232.4	139.3
32	27.4	16.4	92	78.9	47.3	152	130.4	78.1	212	181.8	109.0	272	233.3	139.8
33	28.3	17.0	93	79.8	47.8	153	131.2	78.6	213	182.7	109.5	273	234.2	140.3
34	29.2	17.5	94	80.6	48.3	154	132.1	79.1	214	183.5	110.0	274	235.0	140.8
35	30.0	18.0	95	81.5	48.8	155	132.9	79.7	215	184.4	110.5	275	235.9	141.3
36	30.9	18.5	96	82.3	49.3	156	133.8	80.2	216	185.3	111.0	276	236.7	141.8
37	31.7	19.0	97	83.2	49.9	157	134.7	80.7	217	186.1	111.6	277	237.6	142.4
38	32.6	19.5	98	84.1	50.4	158	135.5	81.2	218	187.0	112.0	278	238.4	142.9
39	33.5	20.0	99	84.9	50.9	159	136.4	81.7	219	187.8	112.6	279	239.3	143.4
40	34.3	20.6	100	85.8	51.4	160	137.2	82.2	220	188.7	113.1	280	240.2	143.9
41	35.2	21.1	101	86.6	51.9	161	138.1	82.7	221	189.6	113.6	281	241.0	144.4
42	36.0	21.6	102	87.5	52.4	162	138.9	83.3	222	190.4	114.1	282	241.9	144.9
43	36.9	22.9	103	88.3	52.9	163	139.8	83.8	223	191.3	114.6	283	242.7	145.4
44	37.7	22.6	104	89.2	53.4	164	140.7	84.3	224	192.1	115.1	284	243.6	146.0
45	38.6	23.1	105	90.1	54.0	165	141.5	84.8	225	193.0	115.6	285	244.4	146.5
46	39.5	23.6	106	90.9	54.5	166	142.4	85.3	226	193.8	116.1	286	245.3	147.0
47	40.3	24.2	107	91.8	55.0	167	143.2	85.8	127	194.7	116.7	287	246.2	147.5
48	41.2	24.7	108	92.6	55.5	168	144.1	86.3	228	195.6	117.2	288	247.0	148.0
49	42.0	25.2	109	93.5	56.0	169	145.0	86.9	229	196.4	117.7	289	247.9	148.6
50	42.9	25.7	110	94.3	56.5	170	145.8	87.4	230	197.3	118.2	290	248.7	149.0
51	43.7	26.2	111	95.2	57.0	171	146.7	87.9	231	198.1	118.7	291	249.6	149.6
52	44.6	26.7	112	96.1	57.6	172	147.5	88.4	232	199.0	119.2	292	250.4	150.1
53	45.5	27.2	113	96.9	58.1	173	148.4	88.9	233	199.8	119.7	293	251.3	150.6
54	46.3	27.8	114	97.8	58.6	174	149.2	89.4	234	200.7	120.3	294	252.2	151.1
55	47.2	28.3	115	98.6	59.1	175	150.1	89.9	235	201.6	120.8	295	253.0	151.6
56	48.0	28.8	116	99.5	59.6	176	151.0	90.4	236	202.4	121.3	296	253.9	152.1
57	48.9	29.3	117	100.4	60.1	177	151.8	91.0	237	203.3	121.8	297	254.7	152.6
58	49.7	29.8	118	101.2	60.6	178	152.7	91.5	238	204.1	122.3	298	255.6	153.1
59	50.6	30.3	119	102.1	61.2	179	153.5	92.0	239	205.0	122.8	299	256.5	153.8
60	51.5	30.8	120	102.9	61.7	180	154.4	92.5	240	205.8	123.3	300	257.3	154.2
Dift.	Dep.	Lat.	Dift	Dep.	Lat.	Dift	Dep.	Lat.	Dift	Dep.	Lat.	Dift	Dep.	Lat.

for 5¼ Points.

Difference of Latitude and Departure for 3 Points.

Dift.	Lat.	Dep.	Dift	Lat.	Dep.	Dift	Lat.	Dep.	Dift	Lat.	Dep.	Dift	Lat	Dep.
1	00.8	00.6	61	50.7	33.9	121	100.6	67.2	181	150.5	100.5	241	200.4	133.5
2	01.7	01.1	62	51.5	34.4	122	101.4	67.8	182	151.3	101.1	242	201.2	134.4
3	02.5	01.7	63	52.4	35.0	123	102.3	68.3	183	152.1	101.7	243	202.0	135.0
4	03.3	02.2	64	53.2	35.6	124	103.1	68.9	184	153.0	102.2	244	202.8	135.5
5	04.2	02.8	65	54.0	36.1	125	103.6	69.4	185	153.8	102.8	245	203.7	136.1
6	05.0	03.3	66	54.9	36.7	126	104.8	70.0	186	154.6	103.3	246	204.5	136.7
7	05.8	03.9	67	55.7	37.2	127	105.6	70.5	187	155.5	103.9	247	205.3	137.2
8	06.7	04.4	68	56.5	37.8	128	106.4	71.1	188	156.3	104.4	248	206.2	137.8
9	07.5	05.0	69	57.4	38.3	129	107.2	71.7	189	157.1	105.0	249	207.0	138.3
10	08.3	05.6	70	58.2	38.9	130	108.1	72.2	190	158.0	105.5	250	207.8	138.0
11	09.1	06.1	71	59.0	39.4	131	108.9	72.8	191	158.8	106.1	251	208.7	139.4
12	10.0	06.7	72	59.9	40.0	132	109.7	73.3	192	159.6	106.7	252	209.5	140.0
13	10.8	07.2	73	60.7	40.6	133	110.6	73.9	193	160.4	107.2	253	210.3	140.5
14	11.6	07.8	74	61.5	41.1	134	111.4	74.4	194	161.3	107.8	254	211.2	141.1
15	12.5	08.3	75	62.4	41.7	135	112.2	75.0	195	162.1	108.3	255	212.0	141.7
16	13.3	08.9	76	63.2	42.2	136	113.2	75.5	196	162.9	108.9	256	212.8	142.2
17	14.1	09.4	77	64.0	42.8	137	113.9	76.1	197	163.8	109.4	257	213.7	142.8
18	15.0	10.0	78	64.8	43.3	138	114.7	76.7	198	164.6	110.0	258	214.5	143.3
19	15.8	10.6	79	65.7	43.9	139	115.6	77.2	199	165.4	110.5	259	215.3	143.9
20	16.6	11.1	80	66.5	44.4	140	116.4	77.8	200	166.3	111.1	260	216.1	144.4
21	17.5	11.7	81	67.3	45.0	141	117.2	78.3	201	167.1	111.7	261	217.0	145.0
22	18.3	12.2	82	68.2	45.6	142	118.1	78.9	202	167.9	112.2	262	217.8	145.5
23	19.1	12.8	83	69.0	46.1	143	118.9	79.4	203	168.8	112.8	263	218.6	146.1
24	20.0	13.3	84	69.8	46.7	144	119.7	80.0	204	169.6	113.3	264	219.5	146.7
25	20.8	13.9	85	70.7	47.2	145	120.5	80.5	205	170.4	113.9	265	220.3	147.2
26	21.6	14.4	86	71.5	47.8	146	121.4	81.1	206	171.3	114.4	266	221.1	147.8
27	22.4	15.0	87	72.3	48.3	147	122.2	81.7	207	172.1	115.0	267	222.0	148.3
28	23.3	15.6	88	73.2	48.9	148	123.0	82.2	208	172.9	115.5	268	222.8	148.9
29	24.1	16.1	89	74.0	49.4	149	123.9	82.8	209	173.8	116.1	269	223.6	149.4
30	24.9	16.7	90	74.8	50.9	150	124.7	83.3	210	174.6	116.7	270	224.5	150.0
31	25.8	17.2	91	75.7	50.6	151	125.5	83.9	211	175.4	117.2	271	225.3	150.5
32	26.6	17.8	92	76.5	51.1	152	126.4	84.4	212	176.2	117.8	272	226.1	151.1
33	27.4	18.3	93	77.3	51.7	153	127.2	85.0	213	177.1	118.3	273	227.0	151.7
34	28.3	18.9	94	78.1	52.2	154	128.0	85.5	214	177.9	118.9	274	227.8	152.2
35	29.1	19.4	95	79.0	52.8	155	128.9	86.1	215	178.7	119.4	275	228.6	152.8
36	29.9	20.0	96	79.8	53.3	156	129.7	86.7	216	179.6	120.0	276	229.4	153.3
37	30.8	20.6	97	80.6	53.9	157	130.5	87.2	217	180.4	120.5	277	230.0	153.9
38	31.6	21.1	98	81.5	54.4	158	131.4	87.8	218	181.2	121.1	278	231.1	154.4
39	32.4	21.7	99	82.3	55.0	159	132.2	88.3	219	182.1	123.7	279	231.9	155.0
40	33.3	22.2	100	83.1	55.6	160	133.0	88.9	220	182.9	122.2	280	232.8	155.5
41	34.1	22.8	101	84.0	56.1	161	133.8	89.4	221	183.7	122.8	281	232.6	156.1
42	34.9	23.3	102	84.8	56.7	162	134.7	90.0	222	184.6	123.3	282	234.4	156.7
43	35.8	23.9	103	85.6	57.2	163	135.5	90.5	223	185.4	123.9	283	235.3	157.2
44	36.6	24.4	104	86.5	57.8	164	136.3	91.1	224	186.2	124.4	284	236.1	157.8
45	37.4	25.0	105	87.3	58.3	165	137.2	91.7	225	187.1	125.0	285	236.9	158.3
46	38.2	25.6	106	88.1	58.9	166	138.0	92.2	226	187.9	125.5	286	237.8	158.9
47	39.1	26.1	107	89.0	59.4	167	138.8	92.8	227	188.7	126.1	287	238.6	159.4
48	39.9	26.7	108	89.8	60.0	168	139.7	93.3	228	189.5	126.7	288	239.4	160.0
49	40.7	27.2	109	90.6	60.5	169	140.5	93.9	229	190.4	127.2	289	240.3	160.5
50	41.6	27.8	110	91.4	61.1	170	141.3	94.4	230	191.2	127.8	290	241.1	161.1
51	42.4	28.3	111	92.3	61.7	171	142.2	95.0	231	192.0	128.3	291	242.9	161.7
52	43.2	28.9	112	93.1	62.2	172	143.0	95.5	232	192.9	128.9	292	243.8	162.2
53	44.1	29.4	113	93.9	62.8	173	143.8	96.1	233	193.7	229.4	293	243.6	162.8
54	44.9	30.0	114	94.8	63.3	174	144.7	96.7	234	194.5	130.0	294	244.4	263.3
95	45.7	30.6	115	95.6	63.9	175	145.5	97.2	235	195.4	130.1	295	245.2	163.9
56	46.6	31.1	116	96.4	64.4	176	146.3	97.8	236	196.2	131.5	296	246.1	164.4
57	47.4	31.7	117	97.3	65.0	177	147.1	98.3	237	197.0	131.7	297	246.9	165.0
58	48.2	32.2	118	98.1	65.5	178	148.0	98.9	238	197.9	132.2	298	247.7	165.5
59	49.1	32.8	119	98.9	66.1	179	148.8	99.2	239	198.7	132.8	299	248.5	166.1
60	50.9	33.3	120	99.8	66.7	180	149.6	100.0	240	199.5	133.3	300	249.4	166.7
Dift.	Dep.	Lat.	Dift	Dep	Lat.	Dift	Dep.	Lat.	Dift	Dep.	Lat.	Dift	Dep.	Lat.

for 5 Points.

Difference of Latitude and Departure for 3¼ Points.

Diſt.	Lat.	Dep.	Diſt	Lat.	Dep	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.
1	00.8	00.6	61	49.0	36.3	121	97.2	72.1	181	145.4	107.8	241	193.5	143.6
2	01.6	01.2	62	49.8	36.9	122	98.0	72.7	182	146.2	108.4	242	194.3	144.2
3	02.4	01.8	63	50.6	37.5	123	98.8	73.3	183	147.0	109.0	243	195.1	144.8
4	03.2	02.4	64	51.4	38.1	124	99.6	73.9	184	147.8	109.6	244	195.9	145.4
5	04.0	03.0	65	52.2	38.7	125	100.4	74.5	185	148.6	110.2	245	196.7	146.0
6	04.8	03.6	66	53.0	39.3	126	101.2	75.1	186	149.4	110.8	246	197.5	146.6
7	05.6	04.2	67	53.8	39.9	127	102.0	75.7	187	150.2	111.4	247	198.4	147.1
8	06.4	04.8	68	54.6	40.5	128	102.8	76.3	188	151.0	112.0	248	199.2	147.7
9	07.2	05.4	69	55.4	41.1	129	103.6	76.9	189	151.8	112.6	249	200.0	148.3
10	08.0	06.0	70	56.2	41.7	130	104.4	77.4	190	152.6	113.2	250	200.8	148.9
11	08.8	06.6	71	57.0	42.3	131	105.2	78.0	191	153.4	113.8	251	201.6	149.5
12	09.6	07.1	72	57.8	42.9	132	106.0	78.6	192	154.2	114.4	252	202.4	150.1
13	10.4	07.7	73	58.6	43.5	133	106.8	79.2	193	155.0	115.0	253	203.2	150.7
14	11.2	08.3	74	59.4	44.1	134	107.6	79.8	194	155.8	115.6	254	204.0	151.3
15	12.0	08.9	75	60.2	44.7	135	108.4	80.4	195	156.6	116.2	255	204.8	151.9
16	12.8	09.5	76	61.0	45.3	136	109.2	81.0	196	157.4	116.8	256	205.6	152.5
17	13.7	10.1	77	61.8	45.9	137	110.0	81.6	197	158.2	117.4	257	206.4	153.1
18	14.5	10.7	78	62.6	46.5	138	110.8	82.2	198	159.0	118.0	258	207.2	153.7
19	15.3	11.3	79	63.4	47.1	139	111.6	82.8	199	159.8	118.6	259	208.0	154.3
20	16.1	11.9	80	64.2	47.7	140	112.4	83.4	200	160.6	119.1	260	208.8	154.9
21	16.9	12.5	81	65.0	48.3	141	113.2	84.0	201	161.4	119.7	261	209.6	155.5
22	17.7	13.1	82	65.8	48.9	142	114.0	84.6	202	162.2	120.3	262	210.4	156.1
23	18.5	13.7	83	66.7	49.4	143	114.8	85.2	203	163.0	120.9	263	211.2	156.7
24	19.3	14.3	84	67.5	50.0	144	115.6	85.8	204	163.8	121.5	264	212.0	157.3
25	20.1	14.9	85	68.3	50.6	145	116.4	86.4	205	164.6	122.1	265	212.8	157.9
26	20.9	15.5	86	69.1	51.2	146	117.2	87.0	206	165.4	122.7	266	213.6	158.5
27	21.7	16.1	87	69.9	51.8	147	118.0	87.6	207	166.2	123.3	267	214.4	159.1
28	22.5	16.7	88	70.7	52.4	148	118.8	88.2	208	167.0	123.9	268	215.2	159.7
29	23.3	17.3	89	71.5	53.0	149	119.7	88.8	209	167.8	124.5	269	216.0	160.3
30	24.1	17.9	90	72.3	53.6	150	120.5	89.4	210	168.6	125.1	270	216.8	160.9
31	24.9	18.5	91	73.1	54.2	151	121.3	90.0	211	169.4	125.7	271	217.6	161.4
32	25.7	19.1	92	73.9	54.8	152	122.1	90.6	212	170.2	126.3	272	218.4	162.0
33	26.5	19.7	93	74.7	55.4	153	122.9	91.1	213	171.0	126.9	273	219.2	162.6
34	27.3	20.3	94	75.5	56.0	154	123.7	91.7	214	171.8	127.5	274	220.0	163.2
35	28.1	20.9	95	76.3	56.6	155	124.5	92.3	215	172.7	128.1	275	220.8	163.8
36	28.9	21.4	96	77.1	57.2	156	125.3	92.9	216	173.5	128.7	276	221.6	164.4
37	29.7	22.0	97	77.9	57.8	157	126.1	93.5	217	174.3	129.3	277	222.4	165.0
38	30.5	22.6	98	78.7	58.4	158	126.9	94.1	218	175.1	129.9	278	223.2	165.6
39	31.3	23.2	99	79.5	59.0	159	127.7	94.7	219	175.9	130.5	279	224.0	166.2
40	32.1	23.8	100	80.3	59.6	160	128.5	95.3	220	176.7	131.1	280	224.8	166.8
41	32.9	24.4	101	81.1	60.2	161	129.3	95.9	221	177.5	131.7	281	225.7	167.4
42	33.7	25.0	102	81.9	60.8	162	130.1	96.5	222	178.3	132.3	282	226.5	168.0
43	34.5	25.6	103	82.7	61.4	163	130.9	97.1	223	179.1	132.9	283	227.3	168.6
44	35.3	26.2	104	83.5	62.0	164	131.7	97.7	224	179.9	133.4	284	228.1	169.2
45	36.1	26.8	105	84.3	62.6	165	132.5	98.3	225	180.7	134.0	285	228.9	169.8
46	36.9	27.4	106	85.1	63.1	166	133.3	98.9	226	181.5	134.6	286	229.7	170.4
47	37.7	28.0	107	85.9	63.7	167	134.1	99.5	227	182.3	135.2	287	230.5	171.0
48	38.5	28.6	108	86.7	64.3	168	134.9	100.1	228	183.1	135.8	288	231.3	171.6
49	39.3	29.2	109	87.5	64.9	169	135.7	100.7	229	183.9	136.4	289	232.1	172.2
50	40.2	29.8	110	88.3	65.5	170	136.5	101.3	230	184.7	137.0	290	232.9	172.8
51	41.0	30.4	111	89.2	66.1	171	137.3	101.9	231	185.5	137.6	291	233.7	173.4
52	41.8	31.0	112	89.9	66.7	172	138.1	102.5	232	186.3	138.2	292	234.5	174.0
53	42.6	31.6	113	90.7	67.3	173	138.9	103.1	233	187.1	138.8	293	235.3	174.6
54	43.4	32.2	114	91.5	67.9	174	139.7	103.7	234	187.9	139.4	294	236.1	175.1
55	44.2	32.8	115	92.4	68.5	175	140.5	104.3	235	188.7	140.0	295	236.9	175.7
56	45.0	33.4	116	93.2	69.1	176	141.3	104.9	236	189.5	140.6	296	237.7	176.3
57	45.8	34.0	117	94.0	69.7	177	142.1	105.4	237	190.3	141.2	297	238.5	176.9
58	46.6	34.6	118	94.8	70.3	178	142.9	106.0	238	191.1	141.8	298	239.3	177.5
59	47.4	35.1	119	95.6	70.9	179	143.7	106.6	239	191.9	142.4	299	240.1	178.1
60	48.2	35.7	120	96.4	71.5	180	144.5	107.2	240	192.7	143.0	300	240.9	178.7
Diſt.	Dep	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.

for 4¾ Points.

Difference of Latitude and Departure for 3½ Points.

Diſt.	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.
1	00.8	00.6	61	47.1	38.7	121	93.5	76.7	181	139.9	114.8	241	286.2	152.8
2	01.5	01.3	62	47.9	39.3	122	94.3	77.4	182	140.6	115.4	242	287.0	153.5
3	02.3	01.9	63	48.7	40.0	123	95.1	78.0	183	141.4	116.0	243	287.8	154.1
4	03.1	02.5	64	49.5	40.6	124	95.8	78.6	184	142.2	116.7	244	288.6	154.7
5	03.9	03.2	65	50.2	41.2	125	96.6	79.3	185	143.0	117.3	245	289.3	155.4
6	04.6	03.8	66	51.0	41.9	126	97.4	79.9	186	143.7	118.0	246	290.1	156.0
7	05.4	04.4	67	51.8	42.5	127	98.1	80.5	187	144.5	118.6	247	290.9	156.6
8	06.2	05.1	68	52.6	43.1	128	98.9	81.2	188	145.3	119.2	248	291.6	157.3
9	07.0	05.7	69	53.3	43.8	129	99.7	81.8	189	146.1	119.9	249	292.4	157.9
10	07.7	00.3	70	54.1	44.4	130	100.5	82.4	190	146.8	120.5	250	293.2	158.5
11	08.5	07.0	71	54.9	45.0	131	101.2	83.1	191	147.6	121.1	251	294.0	159.2
12	09.3	07.6	72	55.6	45.7	132	102.0	83.7	192	148.4	121.8	252	294.7	159.8
13	10.1	08.2	73	56.4	46.3	133	102.8	84.3	193	149.1	122.4	253	295.5	160.4
14	10.8	08.9	74	57.2	45.9	134	103.6	85.0	194	149.9	123.0	254	296.3	161.1
15	11.6	09.5	75	58.0	47.6	135	104.3	85.6	195	150.7	123.7	255	297.1	161.7
16	12.4	10.1	76	58.7	48.2	136	105.1	86.2	196	151.8	124.3	256	297.8	162.3
17	13.1	10.8	77	59.5	48.8	137	105.9	86.9	197	152.2	124.9	257	298.6	163.0
18	13.9	11.4	78	60.3	49.5	138	106.6	87.5	198	153.0	125.6	258	299.4	163.6
19	14.7	12.0	79	61.1	50.1	139	107.4	88.1	199	153.8	126.2	259	200.1	164.1
20	15.5	12.7	80	61.8	50.7	140	108.2	88.8	200	154.6	126.8	260	200.9	164.9
21	16.2	13.3	81	62.6	51.4	141	109.0	89.4	201	155.3	127.5	261	201.7	165.5
22	17.0	14.0	82	63.4	52.0	142	109.7	90.0	202	156.1	128.1	262	202.5	166.1
23	17.8	14.6	83	64.1	52.6	143	110.5	90.7	203	156.9	128.7	263	203.2	166.8
24	18.5	15.2	84	64.9	53.3	144	111.3	91.3	204	157.6	129.4	264	204.0	167.4
25	19.3	15.9	85	65.7	53.9	145	112.1	92.0	205	158.4	130.0	265	204.8	168.0
26	20.1	16.5	86	66.5	54.5	146	112.8	92.6	206	159.2	130.6	266	205.6	168.7
27	20.9	17.1	87	67.2	55.2	147	113.6	93.2	207	160.0	131.3	267	206.3	169.3
28	21.6	17.8	88	68.0	55.8	148	114.4	93.9	208	160.7	131.9	268	207.1	170.0
29	22.4	18.4	89	68.8	56.4	149	115.1	94.5	209	161.5	132.5	269	207.9	170.7
30	23.2	19.0	90	69.6	57.1	150	115.9	95.1	210	162.3	133.2	270	208.6	171.2
31	24.0	19.7	91	70.3	57.7	151	116.7	95.8	211	163.1	133.8	271	209.4	171.9
32	24.7	20.3	92	71.1	58.3	152	117.5	96.4	212	163.8	134.4	272	210.2	172.5
33	25.5	20.9	93	71.9	59.0	153	118.2	97.0	213	164.6	125.1	273	211.0	173.1
34	26.3	21.6	94	72.6	59.6	154	119.0	97.7	214	165.4	135.7	274	211.7	173.8
35	27.1	22.2	95	73.4	60.2	155	119.8	98.3	215	166.1	136.3	275	212.5	174.4
36	27.8	22.8	96	74.2	60.9	156	120.6	98.9	216	166.9	137.0	276	213.3	175.0
37	28.6	23.5	97	75.0	61.5	157	121.3	99.6	217	167.7	137.6	277	214.1	175.7
38	29.4	24.1	98	75.7	62.1	158	122.1	100.2	218	168.5	138.2	278	214.8	176.3
39	30.1	24.7	99	76.5	62.8	159	122.9	100.8	219	169.2	138.9	279	215.6	176.9
40	30.9	25.4	100	77.3	63.4	160	123.6	101.5	220	170.0	139.5	280	216.4	177.6
41	31.3	26.0	101	78.1	64.0	161	124.4	102.1	221	170.8	140.1	281	217.1	178.2
42	32.5	26.6	102	78.8	64.7	162	125.2	102.7	222	171.6	140.8	282	217.9	178.8
43	33.2	27.3	103	79.6	65.3	163	126.0	103.4	223	172.3	141.4	283	218.7	179.5
44	34.0	27.9	104	80.4	66.0	164	126.7	104.0	224	173.1	142.0	284	219.5	180.1
45	34.8	28.5	105	81.1	66.6	165	127.5	104.6	225	173.9	142.7	285	220.2	180.7
46	35.6	29.2	106	81.9	57.2	166	128.3	105.3	226	174.6	143.3	286	221.0	181.4
47	36.3	29.8	107	82.7	67.9	167	129.1	105.9	227	175.4	144.0	287	221.8	182.0
48	37.1	30.4	108	83.5	68.5	168	129.8	106.5	228	176.2	144.6	288	222.6	182.6
49	37.9	31.1	109	84.2	69.1	169	130.6	107.2	229	177.0	145.2	289	223.3	183.3
50	38.6	31.7	110	85.0	69.8	170	131.4	107.8	230	177.7	145.9	290	224.1	183.9
51	39.4	32.3	111	85.8	70.4	171	132.1	108.4	231	178.5	146.5	291	224.9	184.5
52	40.2	33.0	112	86.6	71.0	172	132.9	109.1	232	179.3	147.1	292	225.6	185.2
53	41.0	33.6	113	87.3	71.7	173	133.7	109.7	233	180.1	147.8	293	226.4	185.8
54	42.7	34.2	114	88.1	72.3	174	134.5	110.3	234	180.8	148.4	294	227.2	186.4
55	42.5	34.9	115	88.9	72.9	175	135.2	111.0	235	181.6	149.0	295	228.0	187.1
56	43.3	35.5	116	89.6	73.6	176	136.0	111.6	236	182.4	149.7	296	228.7	187.7
57	44.1	36.1	117	90.4	74.2	177	136.8	112.2	237	183.1	150.3	297	229.5	188.3
58	44.8	36.8	118	91.2	74.8	178	137.6	112.9	238	183.9	150.9	298	230.3	189.0
59	45.6	37.4	119	92.0	75.5	179	138.3	113.5	239	184.7	151.6	299	231.1	189.6
60	46.4	38.0	120	92.7	76.1	180	139.1	114.1	240	185.5	152.2	300	231.8	190.2
Diſt.	Deo	Lat.	Diſt	Dep.	Lar.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.

for 4½ Points.

Difference of Latitude and Departure for 1¼ Point.

Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.
1	01.0	00.2	61	59.2	14.8	121	117.4	29.4	181	175.6	44.0	241	233.8	58.6
2	01.9	00.5	62	60.1	15.1	122	118.3	29.6	182	176.5	44.2	242	234.7	58.8
3	02.9	00.7	63	61.1	15.3	123	119.3	29.9	183	177.5	44.5	243	235.7	59.0
4	03.9	01.0	64	62.1	15.6	124	120.3	30.1	184	178.5	44.7	244	236.7	59.3
5	04.9	01.2	65	63.1	15.8	125	121.3	30.4	185	179.5	45.0	245	237.7	59.5
6	05.8	03.5	66	64.0	16.0	122	122.2	30.6	186	180.4	45.2	246	238.6	59.8
7	06.8	01.7	67	65.0	16.3	127	123.2	30.9	187	181.4	45.4	247	239.6	60.0
8	07.8	01.9	68	66.0	16.5	128	124.2	31.1	188	182.4	45.7	248	240.6	60.3
9	08.7	02.2	69	66.9	16.8	129	125.1	31.3	189	183.3	45.9	249	241.5	60.5
10	09.7	02.4	70	67.9	17.0	130	126.1	31.6	190	184.3	46.2	250	242.5	60.7
11	10.7	02.7	71	68.9	17.3	131	127.1	31.8	191	185.3	46.4	251	243.5	61.0
12	11.6	02.9	72	69.8	17.5	132	128.0	31.1	192	186.2	46.7	252	244.4	61.2
13	12.6	03.2	73	70.8	17.7	133	129.0	32.3	193	187.2	46.9	253	245.4	61.5
14	13.6	03.4	74	71.8	18.0	134	130.0	32.6	194	188.2	47.1	254	246.4	61.7
15	14.6	03.6	75	72.8	18.2	135	131.0	32.8	195	189.2	47.4	255	247.4	62.0
16	15.5	03.9	76	73.7	18.5	136	131.9	33.0	196	190.1	47.6	256	248.3	62.2
17	16.5	04.1	77	74.7	18.7	137	132.9	33.3	197	191.1	47.9	257	249.3	62.5
18	17.5	04.4	78	75.7	19.0	138	133.9	33.5	198	192.1	48.1	258	250.3	62.7
19	18.4	04.6	79	76.6	19.2	139	134.8	33.8	199	193.0	48.4	259	251.2	62.9
20	19.4	04.9	80	77.6	19.4	140	135.8	34.0	100	194.0	48.6	260	252.2	63.2
21	20.4	05.1	81	78.6	19.7	141	136.8	34.3	101	195.0	48.8	261	253.2	63.4
22	21.3	05.3	82	79.5	19.9	142	137.7	34.5	102	195.9	49.1	262	254.1	63.7
23	22.3	05.6	83	80.5	20.2	143	138.7	34.7	103	196.9	49.3	263	255.1	63.9
24	23.3	05.8	84	81.5	20.4	144	139.7	35.0	104	197.9	49.6	264	256.1	64.2
25	24.3	06.1	85	82.5	20.7	145	140.7	35.2	105	198.9	49.8	265	257.1	64.4
26	25.2	06.3	86	83.4	20.9	146	141.6	35.5	106	199.8	50.1	266	258.0	64.6
27	26.2	06.6	87	84.4	21.1	147	142.6	35.7	107	200.8	50.3	267	259.0	64.9
28	27.2	06.8	88	85.4	21.4	148	143.6	36.0	108	201.8	50.5	268	260.0	65.1
29	28.1	07.0	89	86.3	21.6	149	144.5	36.2	109	202.7	50.8	269	260.9	65.4
30	29.1	07.3	90	87.3	21.9	150	145.5	36.5	110	203.7	51.0	270	261.9	65.6
31	30.1	07.5	91	88.3	22.1	151	146.5	36.7	211	204.7	51.3	271	262.9	65.9
32	31.0	07.8	92	89.2	22.4	152	147.4	36.9	212	205.6	51.5	272	263.8	66.1
33	32.0	08.0	93	90.2	22.6	153	148.4	37.2	213	206.6	51.8	273	264.8	66.3
34	33.0	08.3	94	91.2	22.8	154	149.4	37.4	214	207.6	52.0	274	265.8	66.6
35	34.0	08.5	95	92.2	23.1	155	150.4	37.7	215	208.6	52.2	275	266.8	66.8
36	34.9	08.7	96	93.1	23.3	156	151.3	37.9	216	209.5	52.5	276	267.7	67.1
37	35.9	09.0	97	94.1	23.6	157	152.3	38.2	217	210.5	52.7	277	268.7	67.3
38	36.9	09.2	98	95.1	23.8	158	153.3	38.4	218	211.5	53.0	278	269.7	67.6
39	37.8	09.5	99	96.0	24.1	159	154.2	38.6	219	212.4	53.2	279	270.6	67.8
40	38.8	09.7	100	97.0	24.3	160	155.2	38.9	220	213.4	53.5	280	271.6	68.0
41	39.8	10.0	101	98.0	24.5	161	156.2	39.1	221	214.4	53.7	281	272.6	68.3
42	40.7	10.2	102	98.9	24.8	162	157.1	39.4	222	215.3	53.9	282	273.5	68.5
43	41.7	10.4	103	99.9	25.0	163	158.1	39.6	223	216.3	54.2	283	274.5	68.8
44	42.7	10.7	104	100.9	25.3	164	159.1	39.9	224	217.3	54.4	284	275.5	69.0
45	43.7	10.9	105	101.9	25.5	165	160.1	40.1	225	218.3	54.7	285	276.5	69.3
46	44.6	11.2	106	102.8	25.8	166	161.0	40.3	226	219.2	54.9	286	277.4	69.5
47	45.6	11.4	107	103.8	26.0	167	162.0	40.6	227	220.2	55.2	287	278.4	69.7
48	46.6	11.7	108	104.8	26.2	168	163.0	40.8	228	221.2	55.4	288	279.4	70.0
49	47.5	11.9	109	105.7	26.5	169	163.9	41.1	229	222.1	55.6	289	280.3	70.2
50	48.5	12.2	110	106.7	26.7	170	164.9	41.3	230	223.1	55.9	290	281.3	70.5
51	49.5	12.4	111	107.7	27.0	171	165.9	41.6	231	224.1	56.1	291	282.3	70.7
52	50.4	12.6	112	108.6	27.2	172	166.8	41.8	232	225.0	56.4	292	283.2	71.0
53	51.4	12.9	113	109.6	27.5	173	167.8	42.0	233	226.0	56.6	293	284.2	71.2
54	52.4	13.1	114	110.6	27.7	174	168.8	42.3	234	227.0	56.9	294	285.2	71.4
55	53.4	13.4	115	111.6	27.9	175	169.8	42.5	235	228.0	57.1	295	286.2	71.7
56	54.3	13.6	116	112.5	28.2	176	170.7	42.8	236	228.9	57.3	296	287.1	71.9
57	55.3	13.9	117	113.5	28.4	177	171.7	43.0	237	229.9	57.6	297	288.1	72.2
58	56.3	14.1	118	114.5	28.7	178	172.7	43.3	238	230.9	57.8	298	289.1	72.4
59	57.2	14.3	119	115.4	28.9	179	173.6	43.5	239	231.8	58.1	299	290.0	72.7
60	58.2	14.6	120	116.4	29.2	180	174.6	43.7	240	232.8	58.3	300	291.0	72.9
Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.

for 6¾ Points.

Difference of Latitude and Departure for 1½ Points.

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	01.0	00.3	61	58.4	17.7	121	215.8	35.1	181	173.2	52.5	241	230.6	69.9
2	01.9	00.6	62	59.3	18.0	122	116.8	35.4	182	174.2	52.8	242	231.6	70.2
3	02.9	00.9	63	60.3	18.3	123	117.7	35.7	183	175.1	53.1	243	232.5	70.5
4	03.8	01.2	64	61.2	18.6	124	118.7	36.0	184	176.1	53.4	244	233.5	70.8
5	04.8	01.5	65	62.2	18.9	125	119.6	36.3	185	177.0	53.7	145	234.5	71.0
6	05.7	01.7	66	63.2	19.1	126	120.6	36.5	186	178.0	53.9	246	235.4	71.3
7	06.7	02.0	67	64.1	19.4	127	121.5	36.8	187	179.0	54.2	247	236.4	71.6
8	07.7	02.3	68	65.1	19.7	128	122.5	37.1	188	179.9	54.5	248	237.3	71.9
9	08.6	02.6	69	66.0	20.0	129	123.5	37.4	189	180.9	54.8	249	238.3	72.2
10	09.6	02.9	70	67.0	20.3	130	124.4	37.7	190	181.8	55.1	250	239.2	72.5
11	10.5	03.2	71	67.9	20.6	131	125.4	38.0	191	182.8	55.4	251	240.2	72.8
12	11.5	03.5	72	68.8	20.9	132	126.3	38.3	192	183.7	55.7	252	241.2	73.1
13	12.4	03.8	73	69.9	21.2	133	127.3	38.6	193	184.7	56.0	253	242.1	73.4
14	13.4	04.1	74	70.8	21.5	134	128.2	38.9	194	185.7	56.3	254	243.1	73.7
15	14.4	04.4	75	71.8	21.8	135	129.2	39.2	195	186.6	56.6	255	244.0	74.0
16	15.3	04.6	76	72.7	22.0	136	130.2	39.4	196	187.6	56.8	256	245.0	74.2
17	16.3	04.9	77	73.7	22.3	137	131.1	39.7	197	188.5	57.1	257	245.9	74.5
18	17.2	05.2	78	74.6	22.6	148	132.1	40.0	198	189.2	57.4	258	246.9	74.8
19	18.2	05.5	79	75.6	22.9	139	133.0	40.3	199	190.4	56.7	259	247.9	75.1
20	19.1	05.8	80	76.6	23.2	140	134.0	40.6	200	191.4	58.0	260	248.8	75.4
21	20.1	06.1	81	77.5	23.5	141	134.9	40.9	201	192.4	58.3	261	249.8	75.7
22	21.1	06.4	82	78.5	23.8	142	135.9	41.2	202	193.3	58.6	261	250.7	76.0
23	22.0	06.7	83	79.4	24.1	143	136.9	41.5	203	194.3	58.9	263	251.7	76.3
24	23.0	07.0	84	80.4	24.4	144	137.8	41.8	204	195.2	59.2	264	252.6	76.6
25	23.9	07.3	85	81.3	24.7	145	138.8	42.1	205	196.2	59.5	265	253.6	76.9
26	24.9	07.5	86	82.3	24.9	146	139.7	42.3	206	197.1	59.7	266	254.6	77.1
27	25.8	07.8	87	83.3	25.2	147	140.7	42.6	207	198.1	60.0	267	255.5	77.4
28	26.8	08.1	88	84.2	25.5	148	141.6	42.9	208	199.1	60.3	268	256.5	77.7
29	27.8	08.4	89	85.2	25.8	149	142.6	43.2	109	200.0	60.6	269	257.4	78.0
30	28.7	08.7	90	86.1	26.1	150	143.5	43.5	210	201.0	60.9	270	258.4	78.3
31	29.7	09.0	91	87.1	26.4	151	144.5	43.8	211	201.9	61.2	271	259.3	78.6
32	30.6	09.3	92	88.0	26.7	152	145.5	44.1	212	202.9	61.5	272	260.3	78.9
33	31.6	09.6	93	89.0	27.0	153	146.4	44.4	213	203.8	61.8	273	261.3	79.2
34	32.5	09.9	94	90.0	27.3	154	147.4	44.7	214	204.8	62.1	274	262.2	79.5
35	33.5	10.2	95	90.9	27.6	155	148.3	45.0	215	205.8	62.4	275	263.2	79.8
36	34.5	10.4	96	91.9	27.8	156	149.3	45.2	216	206.7	62.6	276	264.1	80.0
37	35.4	10.7	97	92.8	28.1	157	150.2	45.5	217	207.7	62.9	277	265.1	80.3
38	36.4	11.0	98	93.8	28.4	158	151.2	45.8	218	208.6	63.2	278	266.0	80.6
39	37.3	11.3	99	94.7	28.7	159	152.2	46.2	219	209.6	63.1	279	267.0	80.9
40	38.3	11.6	100	95.7	29.0	160	153.1	46.4	220	210.5	63.8	280	268.0	81.2
41	39.2	11.9	101	96.7	29.5	161	154.1	46.7	221	211.5	64.1	281	268.9	81.5
42	40.2	12.2	102	97.6	29.6	162	155.0	47.0	222	112.5	64.4	282	269.9	81.8
43	41.2	12.5	103	98.6	29.9	163	156.0	47.3	223	213.4	64.7	283	270.8	82.1
44	41.1	12.8	104	99.5	30.2	164	156.9	47.6	224	214.4	65.0	284	271.8	82.4
45	43.1	13.1	105	100.5	30.5	165	157.9	47.9	225	215.3	65.3	285	272.7	82.7
46	44.0	13.3	106	101.4	30.7	166	158.9	48.1	226	216.3	65.5	286	273.7	82.9
47	45.0	13.6	107	102.4	31.0	167	159.8	48.4	227	217.2	65.8	287	274.7	83.2
48	45.9	13.9	108	103.4	31.3	168	160.8	48.7	228	218.2	66.1	288	275.6	83.5
49	46.9	14.2	109	104.3	31.6	169	161.7	49.0	229	219.2	66.4	289	276.6	83.8
50	47.9	14.5	110	105.3	31.9	170	162.7	49.3	230	210.1	66.7	290	277.5	84.1
51	48.8	14.8	111	106.2	32.2	171	163.6	49.6	231	221.1	67.0	291	278.5	84.4
52	49.8	15.1	112	107.2	32.5	172	164.6	49.9	232	222.0	67.3	292	279.4	84.7
53	50.7	15.4	113	108.1	32.8	173	165.6	50.2	233	223.0	67.6	293	280.4	85.0
54	51.7	15.7	114	109.1	33.1	174	166.5	50.5	234	223.9	67.9	294	281.4	85.3
55	52.6	16.0	115	110.1	33.4	175	167.5	50.8	235	224.9	68.2	295	282.3	85.6
56	53.6	16.2	116	111.0	33.6	176	168.4	51.0	236	225.9	68.4	296	283.3	85.8
57	54.5	16.5	117	112.0	33.9	177	169.4	51.3	237	226.8	68.7	297	284.2	86.1
58	55.5	16.8	118	112.9	34.2	178	170.3	51.6	238	227.8	69.0	298	285.2	86.4
59	56.5	17.1	119	113.9	34.5	179	171.3	51.9	239	228.7	69.3	299	286.1	86.7
60	57.4	17.4	120	114.8	34.8	180	172.3	52.2	240	229.7	69.6	300	287.1	87.0
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

for 6½ Points.

Difference of Latitude and Departure for 1¾ Point.

Dist.	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.9	00.3	61	57.4	20.5	121	113.9	40.8	181	170.4	61.0	241	226.9	81.2
2	01.9	00.7	62	58.4	20.9	122	114.9	41.1	182	171.4	61.3	242	227.8	81.5
3	02.8	01.0	63	59.3	21.2	123	115.8	41.4	183	172.3	61.6	243	228.8	81.8
4	03.8	01.3	64	60.3	21.6	124	116.7	41.8	184	173.2	62.0	244	229.7	82.2
5	04.7	01.7	65	61.2	21.9	125	117.7	42.1	185	174.2	62.3	245	230.7	82.5
6	05.6	02.0	66	62.1	22.2	122	118.6	42.4	186	175.1	62.6	246	231.6	82.9
7	06.6	02.4	67	63.1	22.6	127	119.6	42.8	187	176.1	63.0	247	232.5	83.2
8	07.5	02.7	68	64.0	22.9	128	120.5	43.1	188	177.0	63.3	248	233.5	83.5
9	08.5	03.0	69	65.0	23.2	129	121.5	43.4	189	177.9	63.7	249	234.4	83.9
10	09.4	03.4	70	65.9	23.6	130	122.4	43.8	190	178.9	64.0	250	235.4	84.2
11	10.4	03.7	71	67.8	23.9	131	123.3	44.1	191	179.8	64.3	251	236.3	84.5
12	11.3	04.0	72	68.8	24.2	132	124.3	44.5	192	180.8	64.7	252	237.3	84.9
13	12.2	04.4	73	69.8	24.6	133	125.2	44.8	193	181.7	65.0	253	238.2	85.2
14	13.2	04.7	74	60.7	24.9	134	126.2	45.1	194	182.6	65.3	254	239.1	85.5
15	14.1	05.1	75	70.6	25.3	135	127.1	45.5	195	183.6	65.7	255	240.1	85.9
16	15.1	05.4	76	71.6	25.6	136	128.0	45.8	196	184.5	66.0	256	241.0	86.2
17	16.0	05.7	77	72.5	25.9	137	129.0	46.1	197	185.5	66.3	257	242.0	86.6
18	17.0	06.1	78	73.4	26.3	138	129.9	46.5	198	186.4	66.7	258	242.9	86.9
19	17.9	06.4	79	74.4	26.6	139	130.9	46.8	199	187.4	67.0	259	243.8	87.2
20	18.8	06.7	80	75.3	26.1	140	131.8	47.2	100	188.3	67.4	260	244.8	87.6
21	19.8	07.1	81	76.3	27.3	141	132.8	47.5	101	189.2	67.7	261	245.7	87.9
22	20.7	07.4	82	77.2	27.6	142	133.7	47.8	102	190.2	68.0	262	246.7	88.2
23	21.7	07.7	83	78.1	28.0	143	134.6	48.2	103	191.1	68.4	263	247.6	88.6
24	22.6	08.1	84	79.1	28.3	144	135.6	48.5	104	192.1	68.7	264	248.6	88.9
25	23.5	08.4	85	80.0	28.6	145	136.5	48.8	105	193.0	69.0	265	249.5	89.2
26	24.5	08.8	86	81.0	29.0	146	137.5	49.2	106	194.0	69.4	266	250.4	89.6
27	25.4	09.1	87	81.9	29.3	147	138.4	41.5	107	194.9	69.7	267	251.4	89.9
28	26.4	09.4	88	82.8	29.6	148	139.3	49.8	108	195.8	70.1	268	252.3	90.3
29	27.3	09.8	89	83.8	30.0	149	140.3	50.2	109	196.8	70.4	269	253.3	90.6
30	28.2	10.1	90	84.7	30.3	150	141.2	50.5	110	197.7	70.7	270	254.2	90.9
31	29.2	10.4	91	85.7	30.6	151	142.2	50.9	211	198.7	71.1	271	255.1	91.3
32	30.1	10.8	92	86.6	31.0	152	143.1	51.2	212	199.6	71.4	272	256.1	91.6
33	31.1	11.1	93	87.6	31.3	153	144.0	51.5	213	200.5	71.7	273	257.0	91.0
34	32.0	11.5	94	88.5	31.7	154	145.0	51.9	214	201.5	72.1	274	258.0	92.3
35	33.0	11.8	95	89.4	32.0	155	145.9	52.2	215	202.4	72.4	275	258.9	92.6
36	33.9	12.1	96	90.4	32.3	156	146.6	52.5	216	203.4	72.7	276	259.9	93.0
37	34.8	12.5	97	91.3	32.7	157	147.8	52.9	217	204.3	73.1	277	260.8	93.3
38	35.8	12.8	98	92.3	33.0	158	148.8	53.2	218	205.2	73.4	278	261.7	93.6
39	36.7	13.1	99	93.2	33.3	159	149.7	53.6	219	206.3	73.8	279	262.7	94.0
40	37.7	13.5	100	194.2	33.7	160	150.6	53.9	220	207.1	74.1	280	263.6	94.3
41	38.6	13.8	101	195.1	34.0	161	151.6	51.2	221	208.1	74.4	281	264.6	94.6
42	39.5	14.1	102	196.0	34.4	162	152.5	54.6	222	209.0	74.8	282	265.5	95.0
43	40.5	14.5	103	197.0	34.7	163	153.5	54.9	223	210.0	75.1	283	266.4	95.3
44	41.4	14.8	104	197.9	35.4	164	154.4	55.2	224	210.9	75.4	284	267.4	95.6
45	42.4	15.2	105	198.9	35.4	165	155.3	55.6	225	211.8	75.8	285	268.3	96.0
46	43.3	15.5	106	199.7	35.7	166	156.3	55.9	226	212.8	76.1	286	269.3	96.3
47	44.3	15.8	107	100.8	36.0	167	157.2	56.2	227	213.7	76.5	287	270.2	96.7
48	45.2	16.2	108	101.7	36.4	168	158.2	56.6	228	214.7	76.8	288	271.2	97.0
49	46.1	16.5	109	102.7	36.7	169	159.1	56.9	229	215.6	77.1	289	272.1	97.3
50	47.1	16.8	110	103.6	37.0	170	160.1	57.3	230	216.5	77.5	290	273.0	97.7
51	48.0	17.2	111	104.5	37.4	171	161.9	57.6	231	217.5	77.8	291	274.0	98.0
52	49.0	17.5	112	105.4	37.7	172	161.9	57.9	232	218.4	78.1	292	274.9	98.3
53	49.9	17.9	113	106.4	38.1	173	162.9	58.4	233	219.4	78.5	293	275.9	98.7
54	50.8	18.2	114	107.3	38.4	174	163.8	58.6	234	220.3	78.8	294	276.8	99.0
55	51.8	18.5	115	108.3	38.7	175	164.8	58.9	235	221.3	79.1	295	277.7	99.4
56	52.7	18.9	116	109.2	39.1	176	165.7	59.5	236	222.2	79.5	296	278.7	99.7
57	53.7	19.2	117	110.2	39.4	177	166.6	59.6	237	223.1	79.8	297	279.6	100.0
58	54.6	19.5	118	111.1	39.7	178	167.6	60.0	238	224.1	70.2	298	280.6	100.4
59	55.5	19.9	119	112.0	40.1	179	168.5	60.3	239	225.0	70.5	299	281.5	100.7
60	56.5	20.2	120	113.0	40.4	180	169.5	60.6	240	226.0	70.8	300	282.5	101.0
Dist.	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 6¼ Points.

Difference of Latitude and Departure for 2 Point.

Diſt.	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep	Diſt	Lat.	Dep.
1	00.9	00.4	61	56.4	23.3	121	111.8	46.3	181	167.2	69.3	241	222.7	92.2
2	01.8	00.8	62	57.3	23.7	122	112.7	46.7	182	168.2	69.7	242	223.6	92.6
3	02.8	01.1	6	58.2	24.1	123	113.6	47.1	183	169.1	70.0	243	224.5	93.0
4	03.7	01.5	64	59.1	24.5	124	114.6	47.5	184	170.0	70.4	244	225.4	93.4
5	04.6	01.9	65	60.1	24.9	125	115.5	47.8	185	170.9	70.8	245	226.4	93.8
6	05.5	02.3	66	61.0	25.3	126	116.4	48.2	186	171.9	71.2	246	227.3	94.1
7	06.5	01.7	67	61.9	25.6	127	117.3	48.6	187	172.8	71.6	247	228.2	94.5
8	07.4	03.1	68	62.8	26.0	128	118.3	49.0	188	173.7	72.0	248	229.1	94.9
9	08.3	03.4	69	63.8	26.4	129	119.2	49.4	189	174.6	72.3	249	230.1	95.3
10	09.2	03.8	70	64.7	26.8	130	120.1	49.8	190	175.6	72.7	250	231.0	95.7
11	10.2	04.2	71	65.6	27.2	131	121.0	50.1	191	176.5	73.1	251	231.9	96.1
12	11.1	04.6	72	66.5	27.6	132	122.0	50.5	192	177.4	73.5	252	232.8	96.4
13	12.0	05.0	73	67.5	27.9	133	122.9	50.9	193	178.3	73.9	253	233.8	96.8
14	12.9	05.4	74	68.4	28.3	134	123.8	51.3	194	179.2	74.2	254	234.7	97.2
15	13.9	05.7	75	69.3	28.7	135	124.7	51.7	195	180.2	74.6	255	235.6	97.6
16	14.8	06.1	76	70.2	29.1	136	125.7	52.0	196	181.1	75.0	256	236.5	98.0
17	15.7	06.5	77	71.1	29.5	137	126.6	52.4	197	182.0	75.4	257	237.5	98.4
18	16.6	06.9	78	72.1	29.9	138	127.5	52.8	198	182.9	75.8	258	238.4	98.7
19	17.6	07.3	79	73.0	30.2	139	128.4	53.2	199	183.9	76.2	259	239.3	99.1
20	18.5	07.7	80	73.9	30.6	140	129.4	53.6	200	184.8	76.1	260	240.2	99.5
21	19.4	08.0	81	74.8	31.0	141	130.3	54.0	201	185.7	76.9	261	241.1	99.9
22	20.3	08.4	82	75.8	31.4	142	131.2	54.3	202	186.6	77.3	262	242.1	100.3
23	21.3	08.8	83	76.7	31.8	143	132.1	54.7	203	187.6	77.7	263	243.0	100.7
24	22.2	09.2	84	77.6	32.1	144	133.0	55.1	204	188.5	78.1	264	243.9	101.0
25	23.1	09.6	85	78.5	32.5	145	134.0	55.5	205	189.4	78.5	265	244.8	101.4
26	24.0	10.0	86	79.5	32.9	146	134.9	55.9	206	190.3	78.8	266	245.8	101.8
27	24.9	10.3	87	80.4	33.3	147	135.8	56.3	207	191.3	79.2	267	246.7	102.2
28	25.9	10.7	88	81.3	33.7	148	136.7	56.6	208	192.2	79.6	268	247.6	102.6
29	26.8	11.1	89	82.2	34.1	149	137.7	57.0	209	193.1	80.0	269	248.5	103.0
30	27.7	11.5	90	83.2	34.4	150	138.6	57.4	210	194.0	80.4	270	249.5	103.3
31	28.6	11.9	91	84.1	34.8	151	139.5	57.8	211	194.9	80.8	271	250.4	103.7
32	29.6	12.2	92	85.0	35.2	152	140.4	58.2	212	195.9	81.2	272	251.3	104.1
33	30.5	12.6	93	85.9	35.6	153	141.4	58.6	213	196.8	81.5	273	252.2	104.5
34	31.4	13.0	94	86.9	36.0	154	142.3	58.9	214	197.7	81.9	274	253.2	104.9
35	32.3	13.4	95	87.8	36.4	155	143.2	59.3	215	198.6	82.3	275	254.1	105.2
36	33.3	13.8	96	88.7	36.7	156	144.1	59.7	216	199.6	82.7	276	255.0	105.6
37	34.2	14.2	97	89.6	37.1	157	145.2	60.1	217	200.5	83.0	277	255.9	106.0
38	35.1	14.5	98	90.6	37.5	158	146.0	60.5	218	201.4	83.4	278	256.9	106.4
39	36.0	14.9	99	91.5	37.9	159	146.9	60.9	219	202.3	83.8	279	257.8	106.8
40	37.0	15.3	100	92.4	38.3	160	147.8	61.2	220	203.3	84.2	280	258.7	107.2
41	37.9	15.7	101	93.3	38.7	161	148.8	61.6	221	204.2	84.6	281	259.6	107.5
42	38.8	16.1	102	94.2	39.0	162	149.7	62.0	222	205.1	85.0	282	260.6	107.9
43	39.7	16.5	103	95.1	39.4	163	150.6	62.4	223	206.0	85.3	283	261.5	108.3
44	40.6	16.8	104	96.1	39.8	164	151.5	62.8	224	207.0	85.7	284	262.4	108.7
45	41.6	17.2	105	97.0	40.2	165	152.5	63.1	225	207.9	86.1	285	263.3	109.1
46	42.5	17.6	106	97.9	40.6	166	153.4	63.5	226	208.8	86.5	286	264.2	109.5
47	43.4	18.0	107	98.9	41.0	167	154.3	63.9	227	209.7	86.9	287	265.2	109.8
48	44.4	18.4	108	99.8	41.3	168	155.2	64.3	228	210.7	87.3	288	266.1	110.2
49	45.3	18.8	109	100.7	41.7	169	156.1	64.7	229	211.6	87.6	289	267.0	110.6
50	46.2	19.1	110	101.6	42.1	170	157.1	65.1	230	212.5	88.0	290	267.9	111.0
51	47.1	19.5	111	102.6	42.3	171	158.0	65.4	231	213.4	88.4	291	268.9	111.4
52	48.0	19.9	112	103.5	42.9	172	158.9	65.8	232	214.4	88.8	292	269.8	111.8
53	49.0	20.3	113	104.4	43.2	173	159.8	66.2	233	215.3	89.2	293	270.7	112.1
54	49.9	20.7	114	105.3	43.6	174	160.8	66.6	234	216.2	89.6	294	271.6	112.5
55	50.8	21.0	115	106.3	44.0	175	161.7	67.0	235	217.1	89.9	295	272.6	112.9
56	51.7	21.4	116	107.1	44.4	176	162.6	67.4	236	218.0	90.3	296	273.5	113.3
57	52.7	21.8	117	108.2	44.8	177	163.5	67.7	237	219.0	00.7	297	274.4	113.7
58	53.6	22.2	118	109.0	45.2	178	164.5	68.1	238	219.9	91.1	298	275.3	114.0
59	54.5	22.6	119	109.9	45.5	179	165.4	68.5	239	220.8	91.5	299	276.3	114.4
60	55.4	23.0	120	110.9	45.9	180	166.3	68.9	240	221.7	91.9	300	277.2	114.8
Diſt.	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.

for 6 Points.

Difference of Latitude and Departure for 2¼ Point.

Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.
1	00.9	00.4	61	55.1	26.1	121	199.4	51.7	181	163.6	77.4	241	217.8	103.0
2	01.8	00.9	62	56.0	26.5	122	110.3	52.2	182	164.5	77.8	242	218.7	103.5
3	02.7	01.3	63	57.0	26.9	123	111.2	52.6	183	165.4	78.2	243	219.6	103.9
4	03.6	01.7	64	57.9	27.4	124	112.1	53.0	184	166.3	78.7	244	220.5	104.3
5	04.5	02.1	65	58.8	27.8	125	113.0	53.5	185	167.2	79.1	245	221.4	104.8
6	05.4	02.6	66	59.7	28.2	126	113.9	53.9	186	168.1	79.5	246	222.4	105.2
7	06.3	03.0	67	60.6	28.6	127	114.8	54.3	187	169.0	80.0	247	223.3	105.6
8	07.2	03.4	68	61.5	29.1	128	115.7	54.7	188	169.9	80.4	248	224.2	106.0
9	08.1	03.8	69	62.4	29.5	129	116.6	55.2	189	170.8	80.8	249	225.1	106.5
10	09.0	04.3	70	63.3	29.9	130	117.5	55.6	190	171.7	81.2	250	226.0	106.9
11	09.9	04.7	71	64.2	30.4	131	118.4	56.0	191	172.6	81.7	251	226.9	107.3
12	10.8	05.1	72	65.1	30.8	132	119.3	56.4	192	173.6	82.1	252	227.8	107.8
13	11.8	05.6	73	66.0	31.2	133	120.2	56.9	193	174.5	82.5	253	228.7	108.2
14	12.7	06.0	74	66.9	31.6	134	121.1	57.2	194	175.4	83.0	254	229.6	108.6
15	13.6	06.4	75	67.8	52.1	135	122.0	57.7	195	176.3	83.4	255	230.5	109.0
16	14.5	06.8	76	68.7	32.5	136	122.9	58.2	196	177.2	83.8	256	231.4	109.5
17	15.4	07.3	77	69.6	32.9	137	123.8	58.6	197	178.1	84.2	257	232.3	109.9
18	16.3	07.7	78	70.5	33.4	138	124.7	59.0	198	179.0	84.7	258	233.2	110.3
19	17.2	08.1	79	71.4	33.8	139	125.6	59.4	199	179.9	85.1	259	234.1	110.7
20	18.1	08.6	80	72.3	34.2	140	126.5	59.9	200	180.8	85.5	260	235.0	111.2
21	19.0	09.0	81	73.2	34.6	141	127.4	60.3	201	181.7	85.9	261	235.9	111.6
22	19.9	09.4	82	74.1	35.1	142	128.4	60.7	202	182.6	86.4	262	236.8	112.0
23	20.8	09.8	83	75.0	35.5	143	129.3	61.1	203	183.5	86.8	263	237.7	112.5
24	21.7	10.3	84	75.9	35.9	144	130.2	61.6	204	184.4	87.2	264	238.6	112.9
25	22.6	10.7	85	76.8	36.3	145	131.1	62.0	205	185.3	87.7	265	239.5	113.3
26	23.5	11.1	86	77.7	36.8	146	132.0	62.4	206	186.2	88.1	266	240.4	113.7
27	24.4	11.5	87	78.6	37.2	147	132.9	62.9	207	187.1	88.5	267	241.3	114.2
28	25.3	12.0	88	79.6	37.6	148	133.8	63.3	208	188.0	88.9	268	242.2	114.6
29	26.2	12.4	89	80.5	38.1	149	134.7	63.7	209	188.9	89.4	269	243.1	115.0
30	27.1	12.8	90	81.4	38.5	150	135.6	64.1	210	189.8	89.8	270	244.0	115.5
31	28.0	13.3	91	82.3	38.9	151	136.5	64.6	211	190.7	90.2	271	245.0	115.9
32	28.9	13.7	92	83.2	39.3	152	137.4	65.0	212	191.6	90.6	272	245.9	116.3
33	29.8	14.1	93	84.1	39.8	153	138.3	65.4	213	192.5	91.1	273	246.8	116.7
34	30.7	14.5	94	85.0	40.2	154	139.2	65.8	214	193.4	91.5	274	247.7	117.2
35	31.6	15.0	95	85.9	40.6	155	140.1	66.3	215	194.3	91.9	275	248.6	117.6
36	32.5	15.4	96	86.8	41.0	156	141.0	66.7	216	195.2	92.4	276	249.5	118.0
37	33.4	15.8	97	87.7	41.5	157	141.9	67.1	217	196.1	92.8	277	250.4	118.4
38	34.4	16.2	98	88.6	41.9	158	142.8	67.6	218	197.0	93.2	278	251.3	118.9
39	35.3	16.7	99	89.5	42.3	159	143.7	68.0	219	197.9	93.6	279	252.2	119.3
40	36.2	17.1	100	90.4	42.8	160	144.6	68.4	220	198.8	94.1	280	253.1	119.7
41	37.1	17.5	101	91.3	43.2	161	145.5	68.8	221	199.8	94.5	281	254.0	120.2
42	38.0	18.0	102	92.2	43.6	162	146.4	69.3	222	200.7	94.9	282	254.9	120.6
43	38.9	18.4	103	93.1	44.0	163	147.3	09.7	223	201.6	95.4	283	255.8	121.0
44	39.8	18.8	104	94.0	44.5	164	148.2	70.1	224	202.5	95.8	284	256.7	121.4
45	40.7	19.2	105	94.9	44.9	165	149.1	70.6	225	203.4	96.2	285	257.6	121.9
46	41.6	19.1	106	95.8	45.3	166	150.0	71.0	226	204.3	96.6	286	258.5	122.3
47	42.5	20.7	107	96.7	45.8	167	151.0	71.4	227	205.2	97.1	287	259.4	122.7
48	43.4	20.5	108	97.6	45.2	168	151.9	71.8	228	206.1	97.5	288	260.3	123.1
49	44.3	21.0	109	98.5	46.6	169	152.8	72.3	229	207.0	97.9	289	261.2	123.6
50	45.2	21.4	110	99.4	46.0	170	153.7	72.7	230	207.0	98.3	290	262.1	124.0
51	46.1	21.8	111	100.3	47.5	171	154.6	73.1	231	208.8	98.8	291	263.0	124.4
52	47.0	22.2	112	101.2	47.9	172	155.5	73.5	232	209.7	99.1	292	263.9	124.9
53	47.9	22.7	113	102.1	48.3	173	156.4	74.0	233	210.6	99.6	293	264.8	125.3
54	48.8	23.1	114	103.0	48.7	174	157.3	74.4	234	211.5	100.1	294	265.7	125.7
55	49.7	23.5	115	103.9	49.2	175	158.2	74.8	235	212.4	100.5	295	266.6	126.1
56	50.6	23.9	116	104.8	49.6	176	159.1	75.3	236	213.3	100.9	296	267.6	126.6
57	51.5	24.4	117	105.8	50.0	177	160.0	75.7	237	214.2	101.3	297	268.5	127.0
58	52.4	24.8	118	106.7	50.5	178	160.9	76.1	238	215.1	101.8	298	269.4	127.4
59	53.3	25.2	119	107.6	50.9	179	161.8	76.5	239	216.0	102.2	299	270.3	127.8
60	54.2	25.7	120	108.5	51.3	180	162.7	77.0	240	216.9	102.6	300	271.2	128.3
Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.

For 5¾ Points.

Difference of Latitude and Departure for 2½ Points.

Dist.	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.9	00.5	61	53.8	28.7	121	106.7	57.0	181	159.6	85.3	241	212.6	113.5
2	01.8	00.9	62	54.7	29.2	122	107.6	57.5	182	160.5	85.8	242	213.4	114.0
3	02.6	01.4	63	55.6	29.7	123	108.5	58.0	183	161.4	86.2	243	214.3	114.5
4	03.5	01.9	64	56.4	30.2	124	109.4	58.4	184	162.3	86.7	244	215.2	115.0
5	04.4	02.4	65	57.3	30.6	125	110.3	58.9	185	163.2	87.2	245	216.1	115.4
6	05.3	02.8	66	58.2	31.1	126	111.1	59.4	186	164.1	87.6	246	217.0	115.9
7	06.2	03.3	67	59.1	31.6	127	112.0	59.8	187	164.9	88.1	247	217.9	116.4
8	07.1	03.8	68	60.0	32.0	128	112.9	60.3	188	165.8	88.6	248	218.7	116.8
9	07.9	04.2	69	60.9	32.5	129	113.8	60.8	189	166.7	89.1	249	219.6	117.3
10	08.8	04.7	70	61.7	33.0	130	114.7	61.3	190	167.6	89.5	250	220.5	117.8
11	09.7	05.2	71	62.6	33.5	131	115.5	61.7	191	168.5	90.0	251	221.4	118.3
12	10.6	05.7	72	63.5	33.9	132	116.4	62.2	192	169.3	90.5	252	222.3	118.7
13	11.5	06.1	73	64.4	34.4	133	117.3	62.7	193	170.2	90.9	253	223.1	119.2
14	12.3	06.6	74	65.3	34.9	134	118.2	63.1	194	171.1	91.4	254	224.0	119.7
15	13.2	07.1	75	66.2	35.3	135	119.1	63.6	195	172.0	91.9	255	224.9	120.1
16	14.2	07.5	76	67.0	35.8	136	120.0	64.1	196	172.9	92.4	256	225.8	120.6
17	15.0	08.0	77	67.9	36.3	137	120.8	64.5	197	173.8	92.8	257	226.7	121.1
18	15.9	08.5	78	68.8	36.8	138	121.7	65.0	198	174.6	93.3	258	227.6	121.6
19	16.8	09.0	79	69.7	37.2	139	122.6	65.5	199	175.5	93.8	259	228.4	122.0
20	17.6	09.4	80	70.6	37.7	140	123.5	66.0	200	176.4	94.2	260	229.3	122.5
21	18.5	09.9	81	71.4	38.2	141	124.4	66.4	201	177.3	94.7	261	230.2	123.0
22	19.4	10.4	82	72.3	38.6	142	125.2	66.9	202	178.2	95.2	262	231.1	123.4
23	20.3	10.8	83	73.2	39.1	143	126.1	67.4	203	179.0	95.6	263	232.0	123.9
24	21.2	11.3	84	74.1	39.6	144	127.0	67.8	204	179.9	96.1	264	232.8	124.4
25	22.1	11.8	85	75.0	40.1	145	127.9	68.3	205	180.8	96.6	265	233.7	124.9
26	22.9	12.3	86	75.9	40.5	146	128.8	68.8	206	181.7	97.1	266	234.6	125.3
27	23.8	12.7	87	76.7	41.0	147	129.6	69.3	207	182.6	97.5	267	235.5	125.8
28	24.7	13.2	88	77.6	41.5	148	130.5	69.7	208	183.5	98.0	268	236.4	126.3
29	25.6	13.7	89	78.5	41.9	149	131.4	70.2	209	184.3	98.5	269	237.3	126.7
30	26.5	14.1	90	79.4	42.4	150	132.3	70.7	210	185.2	98.9	270	238.1	127.2
31	27.3	14.6	91	80.3	42.8	151	133.2	71.1	211	186.1	99.4	271	239.0	127.7
32	28.2	15.1	92	81.1	43.4	152	134.1	71.6	212	187.0	99.9	272	239.9	128.2
33	29.1	15.5	93	82.0	43.8	153	134.9	72.1	213	187.9	100.4	273	240.8	128.6
34	30.0	16.0	94	82.9	44.3	154	135.8	72.6	214	188.7	100.8	274	241.7	129.1
35	30.9	16.5	95	83.8	44.4	155	136.7	73.0	215	189.6	101.3	275	242.5	129.6
36	31.8	17.0	96	84.7	45.2	156	137.6	73.5	216	190.5	101.8	276	243.4	130.0
37	32.6	17.4	97	85.6	45.7	157	138.5	74.0	217	191.4	102.2	277	244.3	130.5
38	33.5	17.9	98	86.4	46.2	158	139.4	74.4	218	192.3	102.7	278	245.2	131.0
39	34.4	18.4	99	87.3	46.6	159	140.2	74.9	219	193.2	103.2	279	246.1	131.5
40	35.3	18.8	100	88.2	47.1	160	141.1	75.4	220	194.0	103.7	280	247.0	131.9
41	36.2	19.3	101	89.1	47.6	161	142.0	75.9	221	194.9	104.1	281	247.8	132.4
42	37.0	19.8	102	90.0	48.1	162	142.9	76.3	222	195.8	104.6	282	248.7	132.9
43	37.9	10.3	103	90.8	48.5	163	143.8	76.8	223	196.7	105.1	283	249.6	133.3
44	38.8	10.7	104	91.7	49.0	164	144.6	77.3	224	197.6	105.5	284	250.5	133.8
45	39.7	11.2	105	92.6	49.5	165	145.5	77.7	225	198.4	106.0	285	251.4	134.3
46	40.6	11.7	106	93.5	49.9	166	146.4	78.2	226	199.3	106.5	285	252.3	134.8
47	41.5	12.1	107	94.4	50.4	167	147.3	78.7	227	200.2	107.0	287	253.1	135.2
48	42.3	12.6	108	95.3	50.9	168	148.2	79.2	228	201.1	107.4	288	254.0	135.7
49	43.2	13.1	109	96.1	51.4	169	149.1	79.6	229	202.0	107.9	289	254.9	136.2
50	44.1	13.6	110	97.0	51.8	170	149.9	80.1	230	202.9	108.4	290	255.8	136.6
51	45.0	14.0	111	97.9	52.3	171	150.8	80.6	231	203.7	108.8	291	256.7	137.1
52	45.9	14.5	112	98.8	52.8	172	151.7	81.0	232	204.6	109.3	292	257.5	137.6
53	46.7	15.0	113	99.7	53.2	173	152.6	81.5	233	205.5	109.8	293	258.4	138.1
54	47.6	15.4	114	100.5	53.7	174	153.5	82.0	234	206.4	110.3	294	259.3	138.5
55	48.5	15.9	115	101.4	54.2	175	154.3	82.5	235	207.3	110.7	295	260.2	139.0
56	49.4	16.4	116	102.3	54.7	176	155.2	82.9	236	208.2	111.2	296	261.1	139.5
57	50.3	16.9	117	103.2	55.1	177	156.1	83.4	237	209.0	111.7	297	262.0	139.9
58	51.2	17.3	118	104.1	55.6	178	157.0	83.9	238	209.9	112.1	298	262.8	140.4
59	52.0	17.8	119	105.0	56.1	179	157.9	84.3	239	210.8	112.6	299	263.7	140.9
60	52.9	18.3	120	105.8	56.5	180	158.8	84.8	240	211.7	113.1	300	264.6	141.4
Dist.	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep	Lat.

for 5½ Points.

Difference of Latitude and Departure for 2¾ Point.

Diſt.	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.
1	00.9	00.5	61	52.3	31.4	121	103.8	62.2	181	155.2	93.0	241	206.7	123.9
2	01.7	01.0	62	53.2	31.9	122	104.6	62.7	182	156.1	93.5	242	207.6	124.4
3	02.6	01.5	63	54.0	32.4	123	105.5	63.2	183	157.0	94.0	243	208.4	124.9
4	03.4	02.1	64	54.9	32.9	124	106.4	63.7	184	157.8	94.6	244	209.3	125.4
5	04.3	02.6	65	55.8	33.4	125	107.2	64.2	185	158.7	95.1	245	210.1	125.9
6	05.1	03.1	66	56.6	33.9	126	108.1	64.8	186	159.5	95.6	246	211.0	126.4
7	06.0	03.6	67	57.5	34.4	127	108.9	65.3	187	160.4	96.1	247	211.9	126.9
8	06.9	04.1	68	58.3	35.0	128	109.8	65.8	188	161.2	96.6	248	212.7	127.4
9	07.7	04.6	69	59.2	35.5	129	110.6	66.3	189	162.1	97.1	249	213.6	128.0
10	08.6	05.1	70	60.0	36.0	130	111.5	66.8	190	163.0	97.6	250	214.4	128.5
11	09.4	05.7	71	60.9	36.5	131	112.4	67.3	191	163.8	98.2	251	215.3	129.0
12	10.3	06.2	72	61.8	37.0	132	113.2	67.8	192	164.7	98.7	252	216.1	129.5
13	11.2	06.7	73	62.6	37.6	133	114.1	68.4	193	165.5	99.2	253	217.0	130.0
14	12.0	07.2	74	63.5	38.0	134	114.9	68.9	194	166.4	99.7	254	217.9	130.5
15	12.5	07.7	75	64.3	38.6	135	115.8	69.4	195	167.3	100.2	255	218.7	131.0
16	13.7	08.2	76	65.2	39.1	136	116.6	69.9	196	168.1	100.7	256	219.6	131.1
17	14.6	08.7	77	66.0	39.6	137	117.5	70.4	197	169.0	101.2	257	220.4	132.1
18	15.4	09.3	78	66.9	40.1	138	118.4	70.9	198	169.8	101.8	258	221.3	132.6
19	16.3	09.8	79	67.8	40.6	139	119.2	71.4	199	170.7	102.3	259	222.1	133.1
20	17.2	10.3	80	68.6	41.1	140	120.1	72.0	200	171.5	102.8	260	223.0	133.6
21	18.0	10.8	81	69.5	41.6	141	120.9	72.5	201	172.4	103.3	261	223.9	134.1
22	18.9	11.3	82	70.3	42.2	142	121.8	73.0	202	173.3	103.8	262	224.7	134.6
23	19.7	11.8	83	71.2	42.7	143	122.7	73.5	203	174.1	104.3	263	225.6	135.2
24	20.6	12.3	84	72.0	43.2	144	123.5	74.0	204	175.0	104.8	264	226.4	135.7
25	21.4	12.9	85	72.9	43.7	145	124.4	74.6	205	175.8	105.4	265	227.3	136.2
26	22.3	13.4	86	73.8	44.2	146	125.2	75.0	206	176.7	105.9	266	228.1	136.7
27	23.2	13.9	87	74.6	44.7	147	126.1	75.6	207	177.5	106.4	267	229.0	137.2
28	24.0	14.4	88	75.5	45.2	148	126.9	76.1	208	178.4	106.9	268	229.9	137.7
29	24.9	14.9	89	76.3	45.7	149	127.8	76.6	209	179.3	107.4	269	230.7	138.2
30	25.7	15.4	90	77.2	46.3	150	128.7	77.1	210	180.1	107.9	270	231.6	138.8
31	26.6	15.9	91	78.1	46.8	151	129.5	77.6	211	181.0	108.4	271	232.4	139.3
32	27.4	16.4	92	78.9	47.3	152	130.4	78.1	212	181.8	109.0	272	233.3	139.8
33	28.3	17.0	93	79.8	47.8	153	131.2	78.6	213	182.7	109.5	273	234.2	140.3
34	29.2	17.5	94	80.6	48.3	154	132.1	79.1	214	183.5	110.0	274	235.0	140.8
35	30.0	18.0	95	81.5	48.8	155	132.9	79.7	215	184.4	110.5	275	235.9	141.3
36	30.9	18.5	96	82.3	49.3	156	133.8	80.2	216	185.3	111.0	276	236.7	141.8
37	31.7	19.0	97	83.2	49.9	157	134.7	80.7	217	186.1	111.6	277	237.6	142.4
38	32.6	19.5	98	84.1	50.4	158	135.5	81.2	218	187.0	112.0	278	238.4	142.9
39	33.5	20.0	99	84.9	50.9	159	136.4	81.7	219	187.8	112.6	279	239.3	143.4
40	34.3	20.6	100	85.8	51.4	160	137.2	82.2	220	188.7	113.1	280	240.2	143.9
41	35.2	21.1	101	86.6	51.9	161	138.1	82.7	221	189.6	113.6	281	241.0	144.4
42	36.0	21.6	102	87.5	52.4	162	138.9	83.3	222	190.4	114.1	282	241.9	144.9
43	36.9	22.9	103	88.3	52.9	163	139.8	83.8	223	191.3	114.6	283	242.7	145.4
44	37.7	22.6	104	89.2	53.4	164	140.7	84.3	224	192.1	115.1	284	243.6	146.0
45	38.6	23.1	105	90.1	54.0	165	141.5	84.8	225	193.0	115.6	285	244.4	146.5
46	39.5	23.6	106	90.9	54.5	166	142.4	85.3	226	193.8	116.1	286	245.3	147.0
47	40.3	24.2	107	91.8	55.0	167	143.2	85.8	127	194.7	116.7	287	246.2	147.5
48	41.2	24.7	108	92.6	55.5	168	144.1	86.3	228	195.6	117.2	288	247.0	148.0
49	42.0	25.2	109	93.5	56.0	169	145.0	86.9	129	196.4	117.7	289	247.9	148.6
50	42.9	25.7	110	94.3	56.5	170	145.8	87.4	230	197.3	118.2	290	248.7	149.0
51	43.7	26.2	111	95.2	57.0	171	146.7	87.9	231	198.1	118.7	291	249.6	149.6
52	44.6	26.7	112	96.1	57.6	172	147.5	88.4	232	199.0	119.2	292	250.4	150.1
53	45.5	27.2	113	96.9	58.1	173	148.4	88.9	233	199.8	119.7	293	251.3	150.6
54	46.3	27.8	114	97.8	58.6	174	149.2	89.4	234	200.7	120.3	294	252.2	151.1
55	47.2	28.3	115	98.6	59.1	175	150.1	89.9	235	201.6	120.8	295	253.0	151.6
56	48.0	28.8	116	99.5	59.6	176	151.0	90.4	236	202.4	121.3	296	253.9	152.1
57	48.9	29.3	117	100.4	60.1	177	151.8	91.0	237	203.3	121.8	297	254.7	152.6
58	49.7	29.8	118	101.2	60.6	178	152.7	91.5	238	204.1	122.3	298	255.6	153.1
59	50.6	30.3	119	102.1	61.2	179	153.5	92.0	239	205.0	122.8	299	256.5	153.8
60	51.5	30.8	120	102.9	61.7	180	154.4	92.5	240	205.8	123.3	300	257.3	154.2
Diſt.	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.

for 5¼ Points.

Difference of Latitude and Departure for 3 Points.

Diſt.	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat	Dep.
1	00.8	00.6	61	50.7	33.9	121	100.6	67.2	181	150.5	100.5	241	200.4	133.5
2	01.7	01.1	62	51.5	34.4	122	101.4	67.8	182	151.3	101.1	242	201.2	134.4
3	02.5	01.7	63	52.4	35.0	123	102.3	68.3	183	152.1	101.7	243	202.0	135.0
4	03.3	02.2	64	53.2	35.6	124	103.1	68.9	184	153.0	102.2	244	202.8	135.5
5	04.2	02.8	65	54.0	36.1	125	103.6	69.4	185	153.8	102.8	245	203.7	136.1
6	05.0	03.3	66	54.9	36.7	126	104.8	70.0	186	154.6	103.3	246	204.5	136.7
7	05.8	03.9	67	55.7	37.2	127	105.6	70.5	187	155.5	103.9	247	205.3	137.2
8	06.7	04.4	68	56.5	37.8	128	106.4	71.1	188	156.3	104.4	248	206.2	137.8
9	07.5	05.0	69	57.4	38.3	129	107.2	71.7	189	157.1	105.0	249	207.0	138.3
10	08.3	05.6	70	58.2	38.9	130	108.1	72.2	190	158.0	105.5	250	207.8	138.0
11	09.1	06.1	71	59.0	39.4	131	108.9	72.8	191	158.8	106.1	251	208.7	139.4
12	10.0	06.7	72	59.9	40.0	132	109.7	73.3	192	159.6	106.7	252	209.5	140.0
13	10.8	07.2	73	60.7	40.6	133	110.6	73.9	193	160.4	107.2	253	210.3	140.5
14	11.6	07.8	74	61.5	41.1	134	111.4	74.4	194	161.3	107.8	254	211.2	141.1
15	12.5	08.3	75	62.4	41.7	135	112.2	75.0	195	162.1	108.3	255	212.0	141.7
16	13.3	08.9	76	63.2	42.2	136	113.2	75.5	196	162.9	108.9	256	212.8	142.2
17	14.1	09.4	77	64.0	42.8	137	113.9	76.1	197	163.8	109.4	257	213.7	142.8
18	15.0	10.0	78	64.8	43.3	138	114.7	76.7	198	164.6	110.0	258	214.5	143.3
19	15.8	10.6	79	65.7	43.9	139	115.6	77.2	199	165.4	110.5	259	215.3	143.9
20	16.6	11.1	80	66.5	44.4	140	116.4	77.8	200	166.3	111.1	260	216.1	144.4
21	17.5	11.7	81	67.3	45.0	141	117.2	78.3	201	167.1	111.7	261	217.0	145.0
22	18.3	12.2	82	68.2	45.6	142	118.1	78.9	202	167.9	112.2	262	217.8	145.5
23	19.1	12.8	83	69.0	46.1	143	118.9	79.4	203	168.8	112.8	263	218.6	146.1
24	20.0	13.3	84	69.8	46.7	144	119.7	80.0	204	169.6	113.3	264	219.5	146.7
25	20.8	13.9	85	70.7	47.2	145	120.5	80.5	205	170.4	113.9	265	220.3	147.2
26	21.6	14.4	86	71.5	47.8	146	121.4	81.1	206	171.3	114.4	266	221.1	147.8
27	22.4	15.0	87	72.3	48.3	147	122.2	81.7	207	172.1	115.0	267	222.0	148.3
28	23.3	15.6	88	73.2	48.9	148	123.0	82.2	208	172.9	115.5	268	222.8	148.9
29	24.1	16.1	89	74.0	49.4	149	123.9	82.8	209	173.8	116.1	269	223.6	149.4
30	24.9	16.7	90	74.8	50.9	150	124.7	83.3	210	174.6	116.7	270	224.5	150.0
31	25.8	17.2	91	75.7	50.6	151	125.5	83.9	211	175.4	117.2	271	225.3	150.5
32	26.6	17.8	92	76.5	51.1	152	126.4	84.4	212	176.2	117.8	272	226.1	151.1
33	27.4	18.3	93	77.3	51.7	153	127.2	85.0	213	177.1	118.3	273	227.0	151.7
34	28.3	18.9	94	78.1	52.2	154	128.0	85.5	214	177.9	118.9	274	227.8	152.2
35	29.1	19.4	95	79.0	52.8	155	128.9	86.1	215	178.7	119.4	275	228.6	152.8
36	29.9	20.0	96	79.8	53.3	156	129.7	86.7	216	179.6	120.0	276	229.4	153.3
37	30.8	20.6	97	80.6	53.9	157	130.5	87.2	217	180.4	120.5	277	230.0	153.9
38	31.6	21.1	98	81.5	54.4	158	131.4	87.8	218	181.2	121.1	278	231.1	154.4
39	32.4	21.7	99	82.3	55.0	159	132.2	88.3	219	182.1	123.7	279	231.9	155.0
40	33.3	22.2	100	83.1	55.6	160	133.0	88.9	220	182.9	122.2	280	232.8	155.5
41	34.1	22.8	101	84.0	56.1	161	133.8	89.4	221	183.7	122.8	281	232.6	156.1
42	34.9	23.3	102	84.8	56.7	162	134.7	90.0	222	184.6	123.3	282	234.4	156.7
43	35.8	23.9	103	85.6	57.2	163	135.5	90.5	223	185.4	123.9	283	235.3	157.2
44	36.6	24.4	104	86.5	57.8	164	136.3	91.1	224	186.2	124.4	284	236.1	157.8
45	37.4	25.0	105	87.3	58.3	165	137.2	91.7	225	187.1	125.0	285	236.9	158.3
46	38.2	25.6	106	88.1	58.9	166	138.0	92.2	226	187.9	125.5	286	237.8	158.9
47	39.1	26.1	107	89.0	59.4	167	138.8	92.8	227	188.7	126.1	287	238.6	159.4
48	39.9	26.7	108	89.8	60.0	168	139.7	93.3	228	189.5	126.7	288	239.4	160.0
49	40.7	27.2	109	90.6	60.5	169	140.5	93.9	229	190.4	127.2	289	240.3	160.5
50	41.6	27.8	110	91.4	61.1	170	141.3	94.4	230	191.2	127.8	290	241.1	161.1
51	42.4	28.3	111	92.3	61.7	171	142.2	95.0	231	192.0	128.3	291	242.9	161.7
52	43.2	28.9	112	93.1	62.2	172	143.0	95.5	232	192.9	128.9	292	243.8	162.2
53	44.1	29.4	113	93.9	62.8	173	143.8	96.1	233	193.7	229.4	293	243.6	162.8
54	44.9	30.0	114	94.8	63.3	174	144.7	96.7	234	194.5	130.0	294	244.4	263.3
95	45.7	30.6	115	95.6	63.9	175	145.5	97.2	235	195.4	130.1	295	245.2	163.9
56	46.6	31.1	116	96.4	64.4	176	146.3	97.8	236	196.2	131.5	296	246.1	164.4
57	47.4	31.7	117	97.3	65.0	177	147.1	98.3	237	197.0	131.7	297	246.9	165.0
58	48.2	32.2	118	98.1	65.5	178	148.0	98.9	238	197.9	132.2	298	247.7	165.5
59	49.1	32.8	119	98.9	66.1	179	148.8	99.2	239	198.7	132.8	299	248.5	166.1
60	50.9	33.3	120	99.8	66.7	180	149.6	100.0	240	199.5	133.3	300	249.4	166.7
Diſt.	Dep.	Lat.	Diſt	Dep	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.

for 5 Points.

Difference of Latitude and Departure for 3¼ Points.

Dift.	Lat.	Dep.	Dift	Lat.	Dep	Dift	Lat.	Dep.	Dift	Lat.	Dep.	Dift	Lat.	Dep.
1	00.8	00.6	61	49.0	36.3	121	97.2	72.1	181	145.4	107.8	241	193.5	143.6
2	01.6	01.2	62	49.8	36.9	122	98.0	72.7	182	146.2	108.4	242	194.3	144.2
3	02.4	01.8	63	50.6	37.5	123	98.8	73.3	183	147.0	109.0	243	195.1	144.8
4	03.2	02.4	64	51.4	38.1	124	99.6	73.9	184	147.8	109.6	244	195.9	145.4
5	04.0	03.0	65	52.2	38.7	125	100.4	74.5	185	148.6	110.2	245	196.7	146.0
6	04.8	03.6	66	53.0	39.3	126	101.2	75.1	186	149.4	110.8	246	197.5	146.6
7	05.6	04.2	67	53.8	39.9	127	102.0	75.7	187	150.2	111.4	247	198.4	147.1
8	06.4	04.8	68	54.6	40.5	128	102.8	76.3	188	151.0	112.0	248	199.2	147.7
9	07.2	05.4	69	55.4	41.1	129	103.6	76.9	189	151.8	112.6	249	200.0	148.3
10	08.0	06.0	70	56.2	41.7	130	104.4	77.4	190	152.6	113.2	250	200.8	148.9
11	08.8	06.6	71	57.0	42.3	131	105.2	78.0	191	153.4	113.8	251	201.6	149.5
12	09.6	07.1	72	57.8	42.9	132	106.0	78.6	192	154.2	114.4	252	202.4	150.1
13	10.4	07.7	73	58.6	43.5	133	106.8	79.2	193	155.0	115.0	253	203.2	150.7
14	11.2	08.3	74	59.4	44.1	134	107.6	79.8	194	155.8	115.6	254	204.0	151.3
15	12.0	08.9	75	60.2	44.7	135	108.4	80.4	195	156.6	116.2	255	204.8	151.9
16	12.8	09.5	76	61.0	45.3	136	109.2	81.0	196	157.4	116.8	256	205.6	152.5
17	13.7	10.1	77	61.8	45.9	137	110.0	81.6	197	158.2	117.4	257	206.4	153.1
18	14.5	10.7	78	62.6	46.5	138	110.8	82.2	198	159.0	118.0	258	207.2	153.7
19	15.3	11.3	79	63.4	47.1	139	111.6	82.8	199	159.8	118.6	259	208.0	154.3
20	16.1	11.9	80	64.2	47.7	140	112.4	83.4	200	160.6	119.1	260	208.8	154.9
21	16.9	12.5	81	65.0	48.3	141	113.2	84.0	201	161.4	119.7	261	209.6	155.5
22	17.7	13.1	82	65.8	48.9	142	114.0	84.6	202	162.2	120.3	262	210.4	156.1
23	18.5	13.7	83	66.7	49.4	143	114.8	85.2	203	163.0	120.9	263	211.2	156.7
24	19.3	14.3	84	67.5	50.0	144	115.6	85.8	204	163.8	121.5	264	212.0	157.3
25	20.1	14.9	85	68.3	50.6	145	116.4	86.4	205	164.6	122.1	265	212.8	157.9
26	20.9	15.5	86	69.1	51.2	146	117.2	87.0	206	165.4	122.7	266	213.6	158.5
27	21.7	16.1	87	69.9	51.8	147	118.0	87.6	207	166.2	123.3	267	214.4	159.1
28	22.5	16.7	88	70.7	52.4	148	118.8	88.2	208	167.0	123.9	268	215.2	159.7
29	23.3	17.3	89	71.5	53.0	149	119.7	88.8	209	167.8	124.5	269	216.0	160.3
30	24.1	17.9	90	72.3	53.6	150	120.5	89.4	210	168.6	125.1	270	216.8	160.9
31	24.9	18.5	91	73.1	54.2	151	121.3	90.0	211	169.4	125.7	271	217.6	161.4
32	25.7	19.1	92	73.9	54.8	152	122.1	90.6	212	170.2	126.3	272	218.4	162.0
33	26.5	19.7	93	74.7	55.4	153	122.9	91.1	213	171.0	126.9	273	219.2	162.6
34	27.3	20.3	94	75.5	56.0	154	123.7	91.7	214	171.8	127.5	274	220.0	163.2
35	28.1	20.9	95	76.3	56.6	155	124.5	92.3	215	172.7	128.1	275	220.8	163.8
36	28.9	21.4	96	77.1	57.2	156	125.3	92.9	216	173.5	128.7	276	221.6	164.4
37	29.7	22.0	97	77.9	57.8	157	126.1	93.5	217	174.3	129.3	277	222.4	165.0
38	30.5	22.6	98	78.7	58.4	158	126.9	94.1	218	175.1	129.9	278	223.2	165.6
39	31.3	23.2	99	79.5	59.0	159	127.7	94.7	219	175.9	130.5	279	224.0	166.2
40	32.1	23.8	100	80.3	59.6	160	128.5	95.3	220	176.7	131.1	280	224.8	166.8
41	32.9	24.4	101	81.1	60.2	161	129.3	95.9	221	177.5	131.7	281	225.7	167.4
42	33.7	25.0	102	81.9	60.8	162	130.1	96.5	222	178.3	132.3	282	226.5	168.0
43	34.5	25.6	103	82.7	61.4	163	130.9	97.1	223	179.1	132.9	283	227.3	168.6
44	35.3	26.2	104	83.5	62.0	164	131.7	97.7	224	179.9	133.4	284	228.1	169.2
45	36.1	26.8	105	84.3	62.6	165	132.5	98.3	225	180.7	134.0	285	228.9	169.8
46	36.9	27.4	106	85.1	63.1	166	133.3	98.9	226	181.5	134.6	286	229.7	170.4
47	37.7	28.0	107	85.9	63.7	167	134.1	99.5	227	182.3	135.2	287	230.5	171.0
48	38.5	28.6	108	86.7	64.3	168	134.9	100.1	228	183.1	135.8	288	231.3	171.6
49	39.3	29.2	109	87.5	64.9	169	135.7	100.7	229	183.9	136.4	289	232.1	172.2
50	40.2	29.8	110	88.3	65.5	170	136.5	101.3	230	184.7	137.0	290	232.9	172.8
51	41.0	30.4	111	89.2	66.1	171	137.3	101.9	231	185.5	137.6	291	233.7	173.4
52	41.8	31.0	112	89.9	66.7	172	138.1	102.5	232	186.3	138.2	292	234.5	174.0
53	42.6	31.6	113	90.7	67.3	173	138.9	103.1	233	187.1	138.8	293	235.3	174.6
54	43.4	32.2	114	91.5	67.9	174	139.7	103.7	234	187.9	139.4	294	236.1	175.2
55	44.2	32.8	115	92.4	68.5	175	140.5	104.3	235	188.7	140.0	295	236.9	175.7
56	45.0	33.4	116	93.2	69.1	176	141.3	104.9	236	189.5	140.6	296	237.7	176.3
57	45.8	34.0	117	94.0	69.7	177	142.1	105.4	237	190.3	141.2	297	238.5	176.9
58	46.6	34.6	118	94.8	70.3	178	142.9	106.0	238	191.1	141.8	298	239.3	177.5
59	47.4	35.1	119	95.6	70.9	179	143.7	106.6	239	191.9	142.4	299	240.1	178.1
60	48.2	35.7	120	96.4	71.5	180	144.5	107.2	240	192.7	143.0	300	240.9	178.7
Dift.	Dep	Lat.	Dift	Dep.	Lat.	Dift	Dep.	Lat.	Dift	Dep.	Lat.	Dift	Dep.	Lat.

for 4¾ Points.

Difference of Latitude and Departure for 3½ Points.

Diſt.	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.
1	00.8	00.6	61	47.1	38.7	121	93.5	76.7	181	139.9	114.8	241	286.2	152.8
2	01.5	01.3	62	47.9	39.3	122	94.3	77.4	182	140.6	115.4	242	287.0	153.5
3	02.3	01.9	63	48.7	40.0	123	95.1	78.0	183	141.4	116.0	243	287.8	154.1
4	03.1	02.5	64	49.5	40.6	124	95.8	78.6	184	142.2	116.7	244	288.6	154.7
5	03.9	03.2	65	50.2	41.2	125	96.6	79.3	185	143.0	117.3	245	289.3	155.4
6	04.6	03.8	66	51.0	41.9	126	97.4	79.9	186	143.7	118.0	246	290.1	156.0
7	05.4	04.4	67	51.8	42.5	127	98.1	80.5	187	144.5	118.6	247	290.9	156.6
8	06.2	05.1	68	52.6	43.1	128	98.9	81.2	188	145.3	119.2	248	291.6	157.3
9	07.0	05.7	69	53.3	43.8	129	99.7	81.8	189	146.1	119.9	249	292.4	157.9
10	07.7	00.3	70	54.1	44.4	130	100.5	82.4	190	146.8	120.5	250	293.2	158.5
11	08.5	07.0	71	54.9	45.0	131	101.2	83.1	191	147.6	121.1	251	294.0	159.2
12	09.3	07.6	72	55.6	45.7	132	102.0	83.7	192	148.4	121.8	252	294.7	159.8
13	10.1	08.2	73	56.4	46.3	133	102.8	84.3	193	149.1	122.4	253	295.5	160.4
14	10.8	08.9	74	57.2	45.9	134	103.6	85.0	194	149.9	123.0	254	296.3	161.1
15	11.6	09.5	75	58.0	47.6	135	104.3	85.6	195	150.7	123.7	255	297.1	161.7
16	12.4	10.1	76	58.7	48.2	136	105.1	86.2	196	151.8	124.3	256	297.8	162.3
17	13.1	10.8	77	59.5	48.8	137	105.9	86.9	197	152.2	124.9	257	298.6	163.0
18	13.9	11.4	78	60.3	49.5	138	106.6	87.5	198	153.0	125.6	258	299.4	163.6
19	14.7	12.0	79	61.1	50.1	139	107.4	88.1	199	153.8	126.2	259	200.1	164.1
20	15.5	12.7	80	61.8	50.7	140	108.2	88.8	200	154.6	126.8	260	200.9	164.9
21	16.2	13.3	81	62.6	51.4	141	109.0	89.4	201	155.3	127.5	261	201.7	165.5
22	17.0	14.0	82	63.4	52.0	142	109.7	90.0	202	156.1	128.1	262	202.5	166.1
23	17.8	14.6	83	64.1	52.6	143	110.5	90.7	203	156.9	128.7	263	203.2	166.8
24	18.5	15.2	84	64.9	53.3	144	111.3	91.3	204	157.6	129.4	264	204.0	167.4
25	19.3	15.9	85	65.7	53.9	145	112.1	92.0	205	158.4	130.0	265	204.8	168.0
26	20.1	16.5	86	66.5	54.5	146	112.8	92.6	206	159.2	130.6	266	205.6	168.7
27	20.9	17.1	87	67.2	55.2	147	113.6	93.2	207	160.0	131.3	267	206.3	169.3
28	21.6	17.8	88	68.0	55.8	148	114.4	93.9	208	160.7	131.9	268	207.1	170.0
29	22.4	18.4	89	68.8	56.4	149	115.1	94.5	209	161.5	132.5	269	207.9	170.7
30	23.2	19.0	90	69.6	57.1	150	115.9	95.1	210	162.3	133.2	270	208.6	171.2
31	24.0	19.7	91	70.3	57.7	151	116.7	95.8	211	163.1	133.8	271	209.4	171.9
32	24.7	20.3	92	71.1	58.3	152	117.5	96.4	212	163.8	134.4	272	210.2	172.5
33	25.5	20.9	93	71.9	59.0	153	118.2	97.0	213	164.6	125.1	273	211.0	173.1
34	26.3	21.6	94	72.6	59.6	154	119.0	97.7	214	165.4	135.7	274	211.7	173.8
35	27.1	22.2	95	73.4	60.2	155	119.8	98.3	215	166.1	136.3	275	212.5	174.4
36	27.8	22.8	96	74.2	60.9	156	120.6	98.9	216	166.9	137.0	276	213.3	175.0
37	28.6	23.5	97	75.0	61.5	157	121.3	99.6	217	167.7	137.6	277	214.1	175.7
38	29.4	24.1	98	75.7	52.1	158	122.1	100.2	218	168.5	138.2	278	214.8	176.3
39	30.1	24.7	99	76.5	62.8	159	122.9	100.8	219	169.2	138.9	279	215.6	176.9
40	30.9	25.4	100	77.3	63.4	160	123.6	101.5	220	170.0	139.5	280	216.4	177.6
41	31.3	26.0	101	78.1	64.0	161	124.4	102.1	221	170.8	140.1	281	217.1	178.2
42	32.5	26.6	102	78.8	64.7	162	125.2	102.7	222	171.6	140.8	282	217.9	178.8
43	33.2	27.3	103	79.6	65.3	163	126.0	103.4	223	172.3	141.4	283	218.7	179.5
44	34.0	27.9	104	80.4	66.0	164	126.7	104.0	224	173.1	142.0	284	219.5	180.1
45	34.8	28.5	105	81.1	66.6	165	127.5	104.6	225	173.9	142.7	285	220.2	180.7
46	35.6	29.2	106	81.9	57.2	166	128.3	105.3	226	174.6	143.3	286	221.0	181.4
47	36.3	29.8	107	82.7	67.9	167	129.1	105.9	227	175.4	144.0	287	221.8	182.0
48	37.1	30.4	108	83.5	68.5	168	129.8	106.5	228	176.2	144.6	288	222.6	182.6
49	37.9	31.1	109	84.2	69.1	169	130.6	107.2	229	177.0	145.2	289	223.3	183.3
50	38.6	31.7	110	85.0	69.8	170	131.4	107.8	230	177.7	145.9	290	224.1	183.9
51	39.4	32.3	111	85.8	70.4	171	132.1	108.4	231	178.5	146.5	291	224.9	184.5
52	40.2	33.0	112	86.6	71.0	172	132.9	109.1	232	179.3	147.1	292	225.6	185.2
53	41.0	33.6	113	87.3	71.7	173	133.7	109.7	233	180.1	147.8	293	226.4	185.8
54	42.7	34.2	114	88.1	72.3	174	134.5	110.3	234	180.8	148.4	294	227.2	186.4
55	42.5	34.9	115	88.9	72.9	175	135.2	111.0	235	181.6	149.0	295	228.0	187.1
56	43.3	35.5	116	89.6	73.6	176	136.0	111.6	236	182.4	149.7	296	228.7	187.7
57	44.1	36.1	117	90.4	74.2	177	136.8	112.2	237	183.1	150.3	297	229.5	188.3
58	44.8	36.8	118	91.2	74.8	178	137.6	112.9	238	183.9	150.9	298	230.3	189.0
59	45.6	37.4	119	92.0	75.5	179	138.3	113.5	239	184.7	151.6	299	231.1	189.6
60	46.4	38.0	120	92.7	76.1	180	139.1	114.1	240	185.5	152.2	300	231.8	190.2
Diſt.	Dep	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.

for 4½ Points.

Difference of Latitude and Departure for $3\frac{3}{4}$ Points.

Diſt.	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.
1	00.7	00.7	61	45.2	41.0	121	89.6	81.2	181	134.1	121.5	241	178.5	161.8
2	01.5	01.3	62	45.9	41.6	122	90.4	81.9	182	134.8	122.2	242	179.3	162.5
3	02.2	02.0	63	46.7	42.3	123	91.1	82.6	183	135.6	122.9	243	180.0	163.2
4	03.0	02.7	64	47.4	43.0	124	91.9	83.3	184	136.3	123.5	244	180.7	163.8
5	03.7	03.4	65	48.2	43.6	125	92.6	83.9	185	137.0	124.2	245	181.5	164.5
6	04.4	04.0	66	48.9	44.3	126	93.3	84.6	186	137.8	124.9	246	182.2	165.2
7	05.2	04.7	67	49.6	45.0	127	94.1	85.3	187	138.5	125.6	247	183.0	165.8
8	05.9	05.4	68	50.4	45.7	128	94.8	85.9	188	139.3	126.2	248	183.7	166.5
9	06.7	06.0	69	51.1	46.3	129	95.6	86.6	189	140.0	126.9	249	184.4	167.2
10	07.4	06.7	70	51.9	47.0	130	96.3	87.3	190	140.7	127.6	250	185.2	167.9
11	08.2	07.4	71	52.6	47.7	131	97.0	88.0	191	141.5	128.2	251	185.9	168.5
12	08.9	08.1	72	53.3	48.3	132	97.8	88.6	192	142.2	128.9	252	186.7	169.2
13	09.6	08.7	73	54.1	49.0	133	98.5	89.3	193	143.0	129.6	253	187.4	169.9
14	10.4	09.4	74	54.8	49.7	134	99.3	90.0	194	143.7	130.3	254	188.2	170.5
15	11.1	10.1	75	55.6	50.4	135	100.0	90.6	195	144.4	130.9	255	188.9	171.2
16	11.9	10.7	76	56.3	51.0	136	100.7	91.3	196	145.2	131.6	256	189.6	171.9
17	12.6	11.4	77	57.0	51.7	137	101.5	92.0	197	145.9	132.3	257	190.4	172.6
18	13.3	12.1	78	57.8	52.4	138	102.2	92.7	198	146.7	132.9	258	191.1	173.2
19	14.1	12.8	79	58.5	53.0	139	103.0	93.3	199	147.4	133.6	259	191.9	173.9
20	14.8	13.4	80	59.3	53.7	140	103.7	94.0	200	148.2	134.3	260	192.6	174.6
21	15.6	14.1	81	60.0	54.4	141	104.4	94.7	201	148.9	135.0	261	193.3	175.2
22	16.3	14.8	82	60.7	55.1	142	105.2	95.3	202	149.6	135.6	262	194.1	175.9
23	17.0	15.4	83	61.5	55.9	143	105.9	96.0	203	150.4	136.3	263	194.8	176.6
24	17.8	15.1	84	62.2	56.4	144	106.7	96.7	204	151.1	137.0	264	195.6	177.3
25	18.5	16.8	85	63.0	57.1	145	107.4	97.4	205	151.9	137.6	265	196.3	177.9
26	19.3	17.5	86	63.7	57.7	146	108.2	98.0	206	152.6	138.3	266	197.0	178.6
27	20.0	18.1	87	64.4	58.4	147	108.9	98.7	207	153.3	139.0	267	197.8	179.3
28	20.7	18.8	88	65.2	59.1	148	109.6	99.4	208	154.1	139.7	268	198.5	179.9
29	21.5	19.5	89	65.9	59.8	149	100.4	100.0	209	154.8	140.3	269	199.3	180.6
30	22.2	20.1	90	66.7	60.4	150	101.1	100.7	210	155.6	141.0	270	200.0	181.3
31	23.0	20.8	91	67.4	61.1	151	111.9	101.4	211	156.3	141.7	271	200.7	182.0
32	23.7	21.5	92	68.2	61.8	152	112.6	102.1	212	157.0	142.3	272	201.5	182.6
33	24.4	22.2	93	68.9	62.4	153	113.3	102.7	213	157.8	143.0	273	202.2	183.3
34	25.2	22.8	94	69.6	63.1	154	114.1	103.4	214	158.5	143.7	274	203.0	184.0
35	25.9	23.5	95	70.4	63.8	155	114.8	104.1	215	159.3	144.4	275	203.7	184.6
36	26.7	24.2	96	71.1	64.5	156	115.6	104.7	216	160.0	145.0	276	204.4	185.3
37	27.4	24.8	97	71.9	65.1	157	116.3	105.4	217	160.7	145.7	277	205.2	186.0
38	28.2	25.5	98	72.6	65.8	158	117.0	106.1	218	161.5	146.4	278	205.9	186.7
39	28.9	26.2	99	73.3	66.5	159	117.8	106.8	219	162.2	147.0	279	206.7	187.3
40	29.6	26.9	100	74.1	67.1	160	118.5	107.4	220	163.0	147.7	280	207.4	188.0
41	30.4	27.7	101	74.8	67.8	161	119.3	108.1	221	163.7	148.4	281	208.2	188.7
42	31.1	28.2	102	75.6	68.5	162	120.0	108.8	222	164.4	149.1	282	208.9	189.3
43	31.9	28.9	103	76.3	69.2	163	120.7	109.4	223	165.2	149.7	283	209.6	190.0
44	32.6	29.5	104	77.0	69.8	164	121.5	110.1	224	165.9	150.4	284	210.4	190.7
45	33.3	30.2	105	77.8	70.5	165	122.2	110.8	225	166.7	151.1	285	211.1	191.4
46	34.1	30.9	106	78.5	71.2	166	123.0	111.5	226	167.4	151.7	286	211.9	192.0
47	34.8	31.6	107	79.3	71.8	167	123.7	112.1	227	168.2	152.4	287	212.6	192.7
48	35.6	32.2	108	80.0	72.5	168	124.4	112.8	228	168.9	153.1	288	213.3	193.4
49	36.3	32.9	109	80.7	73.2	169	125.2	113.5	229	169.6	153.8	289	214.1	194.0
50	37.0	33.6	110	81.5	73.9	170	125.9	114.1	230	170.4	154.9	290	214.8	194.7
51	37.8	34.2	111	82.2	74.5	171	126.7	114.8	231	171.1	155.1	291	215.6	195.4
52	38.5	34.9	112	83.0	75.2	172	127.4	115.5	232	171.9	155.8	292	216.3	196.1
53	39.3	35.6	113	83.7	75.9	173	128.2	116.2	233	172.6	156.4	293	217.0	196.7
54	40.0	36.3	114	84.4	76.5	174	128.9	116.8	234	173.3	157.1	294	217.8	197.4
55	40.7	36.9	115	85.2	77.2	175	129.6	117.5	235	174.1	157.8	295	218.5	198.1
56	41.5	37.6	116	85.9	77.9	176	130.4	118.2	236	174.8	158.5	296	219.3	198.7
57	42.2	38.3	117	86.7	78.6	177	131.1	118.8	237	175.6	159.1	297	220.0	199.4
58	43.0	38.9	118	87.4	79.2	178	131.9	119.5	238	176.3	159.8	298	220.7	200.1
59	43.7	39.6	119	88.2	79.9	179	132.6	120.2	239	177.0	160.5	299	221.5	200.8
60	44.5	40.3	120	88.9	80.6	180	133.3	120.9	240	177.8	161.1	300	222.2	201.4
Diſt.	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.

For $4\frac{1}{4}$ Points.

Difference of Latitude and Departure for 4 Points.

Diſt.	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep	Diſt	Lat	Dep.	Diſt	Lat.	Dep.
1	00.7	00.7	61	43.1	43.1	121	85.6	85.6	181	128.0	128.0	241	170.4	170.4
2	01.4	01.4	62	43.8	43.8	122	86.3	86.3	182	128.7	128.7	242	171.1	171.1
3	02.1	02.1	63	44.5	44.5	123	87.0	87.0	183	129.4	129.4	243	171.8	171.8
4	02.8	02.8	64	45.3	45.3	124	87.7	87.7	184	130.1	130.1	244	172.5	172.5
5	03.5	03.5	65	46.0	46.0	125	88.4	88.4	185	130.8	130.8	245	173.2	173.2
6	04.2	04.2	66	46.7	46.7	126	89.1	89.1	186	131.5	131.5	246	173.9	173.9
7	04.9	04.9	67	47.4	47.4	127	89.8	89.8	187	132.1	132.1	247	174.6	174.6
8	05.7	05.7	68	48.1	48.1	128	90.5	90.5	188	132.9	132.9	248	175.4	175.4
9	06.4	06.4	69	48.8	48.8	129	91.2	91.2	189	133.6	133.6	249	176.1	176.1
10	07.1	07.1	70	49.5	49.5	130	91.9	91.9	190	134.3	134.3	250	176.8	176.8
11	07.8	07.8	71	50.2	50.2	131	93.6	92.6	191	135.1	135.1	251	177.5	177.5
12	08.5	08.5	72	50.9	50.9	132	93.3	93.3	192	135.8	135.3	252	178.2	178.2
13	09.2	09.2	73	51.6	51.6	133	94.0	94.0	193	136.5	136.5	253	178.9	178.9
14	09.9	09.9	74	52.3	52.3	134	94.7	94.7	194	137.2	137.2	254	179.6	179.6
15	10.6	10.6	75	53.0	53.0	135	95.5	95.5	195	137.9	137.9	255	180.3	180.3
16	11.3	11.3	76	53.7	53.7	136	96.2	96.2	196	138.6	138.6	256	181.0	181.0
17	12.0	12.0	77	54.4	54.4	137	96.9	96.9	197	139.3	139.3	257	181.7	181.7
18	12.7	12.7	78	55.2	55.2	138	97.6	97.6	198	140.0	140.0	258	182.4	182.4
19	13.4	13.4	79	55.9	55.9	139	98.3	98.3	199	140.7	140.7	259	183.1	183.1
20	14.1	14.1	80	56.6	56.9	140	99.0	99.0	200	141.4	141.4	260	183.8	183.8
21	14.8	14.8	81	57.3	57.3	141	99.7	99.7	201	142.1	142.1	261	184.5	184.5
22	15.6	15.6	82	58.0	58.0	142	100.4	100.4	202	142.8	142.8	262	185.3	185.3
23	16.3	16.3	83	58.7	58.7	143	101.1	101.1	203	143.5	143.5	263	186.0	186.0
24	17.0	17.0	84	59.4	59.4	144	101.8	101.8	204	144.2	144.2	264	186.7	186.7
25	17.7	17.7	85	60.1	60.1	145	102.5	102.5	205	144.9	144.9	265	187.4	187.4
26	18.4	18.4	86	60.8	60.8	146	103.2	103.2	206	145.7	145.7	266	188.1	188.1
27	19.1	19.1	87	61.5	61.5	147	103.9	103.9	207	146.4	146.4	267	188.8	188.8
28	19.8	19.8	88	62.2	62.2	148	104.6	104.6	208	147.1	147.1	268	189.5	189.5
29	20.5	20.5	89	62.9	62.9	149	105.4	105.4	209	147.8	147.8	269	190.2	190.2
30	21.2	21.2	90	63.6	63.6	150	106.1	106.1	210	148.5	148.5	270	190.9	190.9
31	21.9	21.9	91	64.3	64.3	151	106.8	106.8	211	149.2	149.2	271	191.6	191.6
32	22.6	22.6	92	65.1	65.1	152	107.5	107.5	212	149.9	149.9	272	192.3	192.3
33	23.3	23.3	93	65.4	65.8	153	108.2	108.2	213	150.6	150.6	273	193.0	193.0
34	24.0	24.0	94	66.5	66.5	154	108.9	108.9	214	151.3	151.3	274	193.7	193.7
35	24.7	24.7	95	67.2	67.2	155	109.6	109.6	215	152.0	152.0	275	194.4	194.4
36	25.5	25.5	96	67.9	67.9	156	110.3	110.3	216	152.7	152.7	276	195.2	195.2
37	26.2	26.2	97	68.6	68.6	157	111.0	111.0	217	153.4	153.4	277	195.9	195.9
38	26.9	26.9	98	69.3	69.3	158	111.7	111.7	218	154.1	154.1	278	196.6	196.6
39	27.6	27.6	99	70.0	70.0	159	112.4	112.4	219	154.8	154.8	279	197.3	197.3
40	28.3	28.3	100	70.7	70.7	160	113.1	113.1	220	155.6	155.6	280	198.0	198.0
41	29.0	29.0	101	71.4	71.4	161	113.8	113.8	221	156.3	156.3	281	198.7	198.7
42	29.7	29.7	102	72.1	72.1	162	114.5	114.5	222	157.0	157.0	282	199.4	199.4
43	30.4	30.4	103	72.8	72.8	163	115.3	115.3	223	157.7	157.7	283	200.1	200.1
44	31.1	31.1	104	73.5	73.5	164	116.0	116.0	224	158.4	158.4	284	200.8	200.8
45	31.8	31.8	105	74.2	74.2	165	116.7	116.7	225	159.1	159.1	285	201.5	201.5
46	32.5	32.5	106	74.9	74.9	166	117.4	117.4	226	159.8	159.8	286	202.2	202.2
47	33.2	33.2	107	75.7	75.7	167	118.1	118.1	227	160.5	160.5	287	202.9	202.9
48	33.9	33.9	108	76.4	76.4	168	118.8	118.8	228	161.2	161.2	288	203.6	203.6
49	34.6	34.6	109	77.1	77.1	169	119.5	119.5	229	161.9	161.9	289	204.3	204.3
50	35.4	35.4	110	77.8	77.8	170	120.2	120.2	230	162.6	162.6	290	205.1	205.1
51	36.1	36.1	111	78.5	78.5	171	120.9	120.9	231	163.3	163.3	291	205.8	205.8
52	36.8	36.8	112	79.2	79.2	172	121.6	121.6	232	164.0	164.0	292	206.5	205.5
53	37.5	37.5	113	79.9	79.9	173	122.3	122.3	233	164.7	164.7	293	207.2	207.2
54	38.2	38.2	114	80.6	80.6	174	123.0	123.0	234	165.5	165.5	294	207.9	207.9
55	38.9	38.9	115	81.3	81.3	175	123.7	123.7	235	166.2	166.2	295	208.6	208.6
56	39.6	39.6	116	82.0	82.0	176	124.4	124.4	236	166.9	166.9	296	209.3	209.3
57	40.3	40.3	117	82.7	82.7	177	125.2	125.2	237	167.6	167.6	297	210.0	210.0
58	41.0	41.0	118	83.4	83.4	178	125.9	125.9	238	168.3	168.3	298	210.7	210.7
59	41.7	41.7	119	84.1	84.1	179	126.6	126.6	239	169.0	169.0	299	211.4	211.4
60	42.4	42.4	120	84.8	84.8	180	127.3	127.3	240	169.7	169.7	300	212.1	212.1
Diſt.	Dep	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep	Lat.	Diſt	Dep.	Lat.

for 4 Points.

TABLE VI. Difference of Latitude and Departure for 1 Deg.

Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.
1	01.0	00.0	61	61.0	01.1	121	121.0	02.1	181	181.0	03.1	241	241.0	04.1
2	02.0	00.0	62	62.0	01.1	122	122.0	02.1	182	182.0	03.1	242	242.0	04.2
3	03.0	00.1	63	63.0	01.1	123	123.0	02.1	183	183.0	03.2	243	243.0	04.2
4	04.0	00.1	64	64.0	01.1	124	124.0	02.2	184	184.0	03.2	244	244.0	04.2
5	05.0	00.1	65	65.0	01.1	125	125.0	02.2	185	185.0	03.2	245	245.0	04.2
6	06.0	00.1	66	66.0	01.2	126	126.0	02.2	186	186.0	03.2	246	246.0	04.2
7	07.0	00.1	67	67.0	01.2	127	127.0	02.2	187	187.0	03.2	247	247.0	04.2
8	08.0	00.1	68	68.0	01.2	128	128.0	02.2	188	188.0	03.2	248	248.0	04.3
9	09.0	00.2	69	69.0	01.2	129	129.0	02.2	189	189.0	03.3	249	249.0	04.3
10	10.0	00.2	70	70.0	01.2	130	130.0	02.3	190	190.0	03.3	250	250.0	04.3
11	11.0	00.2	71	71.0	01.2	131	131.0	02.3	191	191.0	03.3	251	251.0	04.3
12	12.0	00.2	72	72.0	01.3	132	132.0	02.3	192	192.0	03.3	252	252.0	04.3
13	13.0	00.2	73	73.0	01.3	133	133.0	02.3	193	193.0	03.3	253	253.0	04.3
14	14.0	00.2	74	74.0	01.3	134	134.0	02.3	194	194.0	03.3	254	254.0	04.4
15	15.0	00.3	75	75.0	01.3	135	135.0	02.3	195	195.0	03.4	255	255.0	04.4
16	16.0	00.3	76	76.0	01.3	136	136.0	02.4	196	196.0	03.4	256	256.0	04.4
17	17.0	00.3	77	77.0	01.3	137	137.0	02.4	197	197.0	03.4	257	257.0	04.4
18	18.0	00.3	78	78.0	01.4	138	138.0	02.4	198	198.0	03.4	258	258.0	04.4
19	19.0	00.3	79	79.0	01.4	139	139.0	02.4	199	199.0	03.4	259	259.0	04.4
20	20.0	00.4	80	80.0	01.4	140	140.0	02.4	200	200.0	03.4	260	260.0	04.5
21	21.0	00.4	81	81.0	01.4	141	141.0	02.4	201	201.0	03.5	261	261.0	04.5
22	22.0	00.4	82	82.0	01.4	142	142.0	02.5	202	202.0	03.5	262	262.0	04.5
23	23.0	00.4	83	83.0	01.5	143	143.0	02.5	203	203.0	03.5	263	263.0	04.5
24	24.0	00.4	84	84.0	01.5	144	144.0	02.5	204	204.0	03.5	264	264.0	04.5
25	25.0	00.4	85	85.0	01.5	145	145.0	02.5	205	205.0	03.5	265	265.0	04.6
26	26.0	00.5	86	86.0	01.5	146	146.0	02.5	206	206.0	03.5	266	266.0	04.6
27	27.0	00.5	87	87.0	01.5	147	147.0	02.5	207	207.0	03.6	267	267.0	04.6
28	28.0	00.5	88	88.0	01.5	148	148.0	02.6	208	208.0	03.6	268	268.0	04.6
29	29.0	00.5	89	89.0	01.6	149	149.0	02.6	209	209.0	03.6	269	269.0	04.6
30	30.0	00.5	90	90.0	01.6	150	150.0	02.6	210	210.0	03.6	270	270.0	04.6
31	31.0	00.5	91	91.0	01.6	151	151.0	02.6	211	211.0	03.6	271	271.0	04.7
32	32.0	00.6	92	92.0	01.6	152	152.0	02.6	212	212.0	03.6	272	272.0	04.7
33	33.0	00.6	93	93.0	01.6	153	153.0	02.7	213	213.0	03.7	273	273.0	04.7
34	34.0	00.6	94	94.0	01.6	154	154.0	02.7	214	214.0	03.7	274	274.0	04.7
35	35.0	00.6	95	95.0	01.7	155	155.0	02.7	215	215.0	03.7	275	275.0	04.7
36	36.0	00.6	96	96.0	01.7	156	156.0	02.7	216	216.0	03.7	276	276.0	04.7
37	37.0	00.6	97	97.0	01.7	157	157.0	02.7	217	217.0	03.7	277	277.0	04.8
38	38.0	00.7	98	98.0	01.7	158	158.0	02.7	218	218.0	03.8	278	278.0	04.8
39	39.0	00.7	99	99.0	01.7	159	159.0	02.7	219	219.0	03.8	279	279.0	04.8
40	40.0	00.7	100	100.0	01.7	160	160.0	02.8	220	220.0	03.8	280	280.0	04.8
41	41.0	00.7	101	101.0	01.8	161	161.0	02.8	221	221.0	03.8	281	281.0	04.8
42	42.0	00.7	102	102.0	01.8	162	162.0	02.8	222	222.0	03.8	282	282.0	04.8
43	43.0	00.8	103	103.0	01.8	163	163.0	02.8	223	223.0	03.8	283	283.0	04.9
44	44.0	00.8	104	104.0	01.8	164	164.0	02.8	224	224.0	03.9	284	284.0	04.9
45	45.0	00.8	105	105.0	01.8	165	165.0	02.9	225	225.0	03.9	285	285.0	04.9
46	46.0	00.8	106	106.0	01.8	166	166.0	02.9	226	226.0	03.9	285	286.0	04.9
47	47.0	00.8	107	107.0	01.9	167	167.0	02.9	227	227.0	03.9	287	287.0	04.9
48	48.0	00.8	108	108.0	01.9	168	168.0	02.9	228	228.0	03.9	288	288.0	04.9
49	49.0	00.9	109	109.0	01.9	169	169.0	02.9	229	229.0	03.9	289	289.0	05.0
50	50.0	00.9	110	110.0	01.9	170	170.0	02.9	230	230.0	04.0	290	290.0	05.0
51	51.0	00.9	111	111.0	01.9	171	171.0	03.0	231	231.0	04.0	291	291.0	05.0
52	52.0	00.9	112	112.0	01.9	172	172.0	03.0	232	232.0	04.0	292	292.0	05.0
53	53.0	00.9	113	113.0	02.0	173	173.0	03.0	233	233.0	04.0	293	293.0	05.0
54	54.0	00.9	114	114.0	02.0	174	174.0	03.0	234	234.0	04.0	294	294.0	05.0
55	55.0	01.0	115	115.0	02.0	175	175.0	03.0	235	235.0	04.0	295	295.0	05.1
56	56.0	01.0	116	116.0	02.0	176	176.0	03.0	236	236.0	04.1	296	296.0	05.1
57	57.0	01.0	117	117.0	02.0	177	177.0	03.1	237	237.0	04.1	297	297.0	05.1
58	58.0	01.0	118	118.0	02.1	178	178.0	03.1	238	238.0	04.1	298	298.0	05.1
59	59.0	01.0	119	119.0	02.1	179	179.0	03.1	239	239.0	04.1	299	299.0	05.1
60	60.0	01.1	120	120.0	02.1	180	180.0	03.1	240	240.0	04.1	300	200.0	05.1
Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.

for 89 Degrees.

Difference of Latitude and Departure for 2 Degrees.

Dift.	Lat.	Dep.	Dift	Lat.	Dep.	Dift	Lat.	Dep.	Dift	Lat.	Dep.	Dift	L at.	Dep.
1	01.0	00.0	61	61.0	02.1	121	120.9	04.2	181	180.9	06.3	241	240.9	08.4
2	02.0	00.1	62	62.0	02.2	122	121.9	04.3	182	181.9	06.4	242	241.9	08.5
3	03.0	00.1	63	63.0	02.2	123	122.9	04.3	183	182.9	06.4	243	242.9	08.5
4	04.0	00.1	64	64.0	02.2	124	123.9	04.3	184	183.9	06.4	244	243.9	08.5
5	05.0	00.2	65	65.0	02.3	125	124.9	04.4	185	184.9	06.5	245	244.9	08.6
6	06.0	00.2	66	66.0	02.3	126	125.9	04.4	186	185.9	06.5	246	245.9	08.6
7	07.0	00.2	67	67.0	02.3	127	126.9	04.4	187	186.9	06.5	247	246.9	08.6
8	08.0	00.3	68	68.0	02.4	128	127.9	04.5	188	187.9	06.6	248	247.9	08.7
9	09.0	00.3	69	69.0	02.4	129	128.9	04.5	189	188.9	06.6	249	248.9	08.7
10	10.0	00.3	70	70.0	02.4	130	129.9	04.6	190	189.9	06.7	250	249.9	08.8
11	11.0	00.4	71	71.0	02.5	131	130.9	04.6	191	190.9	06.7	251	250.8	08.8
12	12.0	09.4	72	72.0	02.5	132	131.9	04.6	192	191.9	06.7	252	251.8	08.8
13	13.0	00.5	73	73.0	02.5	133	132.9	04.7	193	192.9	06.8	253	252.8	08.9
14	14.0	00.5	74	74.0	02.6	134	133.9	04.7	194	193.9	06.8	254	253.8	08.9
15	15.0	00.5	75	75.0	02.6	135	134.9	04.7	195	194.9	06.8	255	254.8	08.9
16	16.0	00.6	76	76.0	02.7	136	135.9	04.8	196	195.9	06.9	256	255.8	09.0
17	17.0	00.6	77	77.0	02.7	137	136.9	04.8	197	196.9	06.9	257	256.8	09.0
18	18.0	09.6	78	78.0	02.7	138	137.9	04.8	198	197.9	06.9	258	257.8	09.0
19	19.0	00.7	79	79.0	02.8	139	138.9	04.9	199	198.9	07.0	259	258.8	09.1
20	20.0	00.7	80	80.0	02.8	140	139.9	04.9	200	199.9	07.0	260	259.8	09.1
21	21.0	00.7	81	81.0	02.8	141	140.9	04.9	201	200.9	07.0	261	260.8	09.1
22	22.0	00.8	82	81.9	02.9	142	141.9	05.0	202	201.9	07.1	262	261.8	09.2
23	23.0	00.8	83	82.9	02.9	143	142.9	05.0	203	202.9	07.1	263	262.8	09.2
24	24.0	00.8	84	83.9	02.9	144	143.9	05.0	204	203.9	07.1	264	263.8	09.2
25	25.0	00.9	85	84.9	03.0	145	144.9	05.1	205	204.9	07.2	265	264.8	09.3
26	26.0	00.9	86	85.9	03.0	146	145.9	05.1	206	205.9	07.2	266	265.8	09.3
27	27.0	00.9	87	86.9	03.0	147	146.9	05.1	207	206.9	07.2	267	266.8	09.3
28	28.0	01.0	88	87.9	03.1	148	147.9	06.2	208	207.9	07.3	268	267.8	09.4
29	29.0	01.0	89	88.9	03.1	149	148.9	05.2	209	208.9	07.3	269	268.8	09.4
30	30.0	01.1	90	89.9	03.1	150	149.9	05.3	210	209.9	07.4	270	169.8	09.5
31	31.0	01.1	91	90.9	03.2	151	150.9	05.3	211	210.9	07.4	271	270.8	09.5
32	32.0	01.1	92	91.9	03.2	152	151.0	05.3	212	211.9	07.4	272	271.8	09.5
33	33.0	01.2	93	92.9	03.2	153	152.9	05.4	213	212.9	07.5	273	272.8	09.6
34	34.0	01.2	94	93.9	03.3	154	153.9	05.4	214	213.9	07.5	274	273.8	09.6
35	35.0	01.2	95	94.9	03.3	155	154.9	05.4	215	214.9	07.5	275	274.8	09.6
36	36.0	01.3	96	95.9	03.4	156	155.9	05.5	216	215.9	07.6	276	275.8	09.7
37	37.0	01.3	97	96.9	03.4	157	156.9	05.5	217	216.9	07.6	277	276.8	09.7
38	38.0	01.3	98	97.9	03.4	158	157.9	05.5	218	217.9	07.6	278	277.8	09.7
39	39.0	01.4	99	98.9	03.5	159	158.9	05.6	219	218.9	07.7	279	278.8	09.8
40	40.0	01.4	100	99.9	03.5	160	159.9	05.6	220	219.9	07.7	280	279.8	09.8
41	41.0	01.4	101	100.9	03.5	161	160.9	05.6	221	220.9	07.7	281	280.8	09.8
42	42.0	01.5	102	101.9	03.6	162	161.9	05.7	222	221.9	07.8	282	281.8	09.9
43	43.0	01.5	103	102.9	03.6	163	162.9	05.7	223	222.9	07.8	283	282.8	09.9
44	44.0	01.5	104	103.9	03.6	164	163.9	05.7	224	223.9	07.8	284	283.8	09.9
45	45.0	01.6	105	104.9	03.7	165	164.9	05.8	225	224.9	07.9	285	284.8	10.0
46	46.0	01.6	106	105.9	03.7	166	165.9	05.8	226	225.9	07.9	286	285.8	10.0
47	47.0	01.6	107	106.9	03.7	167	166.9	05.8	127	226.9	07.9	287	286.8	10.0
48	48.0	01.7	108	107.9	03.8	168	167.9	05.9	228	227.9	08.0	288	287.8	10.1
49	49.0	01.7	109	108.9	03.8	169	168.9	05.9	229	228.9	08.0	289	288.8	10.1
50	50.0	01.7	110	109.9	03.8	170	169.9	06.0	230	229.9	08.1	290	289.8	10.2
51	51.0	01.8	111	110.9	03.9	171	170.9	06.0	231	230.9	08.1	291	290.8	10.2
52	52.0	01.8	112	111.9	03.9	172	171.9	06.0	232	231.9	08.1	292	291.8	10.2
53	53.0	01.8	113	112.9	04.0	173	172.9	06.1	233	232.9	08.2	293	292.8	10.3
54	54.0	01.9	114	113.9	04.0	174	173.0	06.1	234	233.9	08.2	294	293.8	10.3
55	55.0	01.9	115	114.9	04.0	175	174.9	06.1	235	234.9	08.2	295	294.8	10.3
56	56.0	02.0	116	115.9	04.1	176	175.9	06.2	236	235.9	08.3	296	295.8	10.4
57	57.0	02.0	117	116.9	04.1	177	176.9	06.2	237	236.9	08.3	297	296.8	10.4
58	58.0	02.0	118	117.9	04.1	178	177.9	06.2	238	237.9	08.3	298	297.8	10.4
59	59.0	02.1	119	118.9	04.2	179	178.9	06.3	239	238.9	08.4	299	298.8	10.5
60	60.0	02.1	120	119.9	04.2	180	179.9	06.3	240	239.9	08.4	300	299.8	10.5
Dift.	Dep.	Lat.	Dift	Dep.	Lat.	Dift	Dep.	Lat.	Dift	Dep.	Lat.	Dift	Dep.	Lat.

for 88 Degrees.

Difference of Latitude and Departure for 3 Degrees.

Dist.	Lat.	Dep.	D ſt	Lat.	Dep.	D ſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.
1	01.0	00.1	61	60.9	03.2	121	120.8	06.3	181	180.7	09.5	241	240.7	12.6
2	02.0	00.1	62	61.9	03.2	122	121.8	06.4	182	181.7	19.5	242	241.7	12.7
3	03.0	00.2	63	62.9	03.3	123	122.8	06.4	183	182.7	19.6	243	242.7	12.7
4	04.0	00.2	64	63.9	03.3	124	123.8	06.5	184	183.7	19.6	244	243.7	12.8
5	05.0	00.3	65	64.9	03.4	125	124.8	06.5	185	184.7	19.7	245	244.7	12.8
6	06.0	00.3	66	65.9	03.5	126	125.8	06.6	186	185.7	19.7	246	245.7	12.9
7	07.0	00.4	67	66.9	03.5	127	126.8	06.6	187	186.7	19.8	247	246.7	12.9
8	08.0	00.4	68	67.9	03.6	128	127.8	06.7	188	187.7	19.8	248	247.7	13.0
9	09.0	00.5	69	68.9	03.6	129	128.8	06.8	189	188.7	19.9	249	248.7	13.0
10	10.0	00.5	70	69.9	03.7	130	129.8	06.8	190	189.7	19.9	250	249.7	13.1
11	11.0	00.6	71	70.9	03.7	131	130.8	06.9	191	190.7	10.0	251	250.6	13.1
12	12.0	00.6	72	71.9	03.8	132	131.8	06.9	192	191.7	10.0	252	251.6	13.2
13	13.0	00.7	73	72.9	03.8	133	132.8	07.0	193	192.7	10.1	253	252.6	13.2
14	14.0	00.7	74	73.9	03.9	134	133.8	07.0	194	193.7	10.1	254	253.6	13.3
15	15.0	00.8	75	74.9	03.9	135	134.8	07.1	195	194.7	10.2	255	254.6	13.3
16	16.0	00.8	76	75.9	04.0	136	135.8	07.1	196	195.7	10.3	256	255.6	13.4
17	17.0	00.9	77	76.9	04.0	137	136.8	07.2	197	196.7	10.3	257	256.6	13.4
18	18.0	00.9	78	77.9	04.1	148	137.8	07.2	198	197.7	10.4	258	257.6	13.5
19	19.0	01.0	79	78.9	04.1	139	138.8	07.3	199	198.7	10.4	259	258.6	13.6
20	20.0	01.0	80	79.9	04.2	140	139.8	07.3	200	199.7	10.5	260	259.6	13.6
21	21.0	01.1	81	80.9	04.2	141	140.8	07.4	201	200.7	10.5	261	260.6	13.7
22	22.0	01.1	82	81.9	04.3	142	141.8	07.4	202	201.7	10.6	262	261.6	13.7
23	23.0	01.2	83	82.9	04.3	143	142.8	07.5	203	202.7	10.6	263	262.6	13.8
24	24.0	01.3	84	83.9	04.4	144	143.8	07.5	204	203.7	10.7	264	263.6	13.8
25	25.0	01.3	85	84.9	04.4	145	144.8	07.6	205	204.7	10.7	265	264.6	13.9
26	26.0	01.4	86	85.9	04.5	146	145.8	07.6	206	205.7	10.8	266	265.6	13.9
27	27.0	01.4	87	86.9	04.6	147	146.8	07.7	207	206.7	10.8	267	266.6	14.0
28	28.0	01.5	88	87.9	04.6	148	147.8	07.7	208	207.7	10.9	268	267.6	14.0
29	29.0	01.5	89	88.9	04.7	149	148.8	07.8	209	208.7	10.9	269	268.6	14.1
30	30.0	01.6	90	89.9	04.7	150	149.8	07.9	210	209.7	11.0	270	269.6	14.1
31	31.0	01.6	91	90.9	04.8	151	150.8	07.9	211	210.7	11.0	271	270.6	14.2
32	32.0	01.7	92	91.9	04.8	152	151.8	08.0	212	211.7	11.1	272	271.6	14.2
33	33.0	01.7	93	92.9	04.9	153	152.8	08.0	213	212.7	11.1	273	272.6	14.3
34	34.0	01.8	94	93.9	04.9	154	153.8	08.1	214	213.7	11.2	274	273.6	14.3
35	35.0	01.8	95	94.9	05.0	155	154.8	08.1	215	214.7	11.2	275	274.6	14.4
36	35.9	01.9	96	95.9	05.0	156	155.8	08.2	216	215.7	11.3	276	275.6	14.4
37	36.9	01.9	97	96.9	05.1	157	156.8	08.2	217	216.7	11.4	277	276.6	14.5
38	37.9	02.0	98	97.9	05.1	158	157.8	08.3	218	217.7	11.4	278	277.6	14.5
39	38.9	02.0	99	98.9	05.2	159	158.8	08.3	219	218.7	11.5	279	278.6	14.6
40	39.9	02.1	100	99.9	05.2	160	159.8	08.4	220	219.7	11.5	280	279.6	14.7
41	40.9	02.1	101	100.9	05.3	161	160.8	08.4	221	220.7	11.6	281	280.6	14.7
42	41.9	02.2	102	101.9	05.3	162	161.8	08.5	222	221.7	11.6	282	281.6	14.8
43	42.9	02.2	103	102.9	01.4	163	162.8	08.5	223	222.7	11.7	283	282.6	14.8
44	43.9	02.3	104	103.9	05.4	164	163.8	08.6	224	223.7	11.7	284	283.6	14.9
45	44.9	02.4	105	104.9	05.5	165	164.8	08.6	225	224.7	11.8	285	284.6	14.9
46	45.9	02.4	106	105.9	05.5	166	165.8	08.7	226	225.7	11.8	286	285.6	15.0
47	46.9	02.5	107	106.9	05.6	167	166.8	08.7	227	226.7	11.9	287	286.6	15.0
48	47.9	02.5	108	107.8	05.7	168	167.8	08.8	228	227.7	11.9	288	287.6	15.1
49	48.9	02.6	109	108.8	05.7	169	168.8	08.8	229	228.7	12.0	289	288.6	15.1
50	49.9	02.6	110	109.8	05.8	170	169.8	08.9	230	229.7	12.0	200	289.6	15.2
51	50.9	02.7	111	110.8	05.8	171	170.8	09.0	231	230.7	12.1	291	290.6	15.2
52	51.9	02.7	112	111.8	05.9	172	171.8	09.0	232	231.7	13.1	292	291.6	15.3
53	12.9	02.8	113	112.8	05.9	173	172.8	09.1	233	232.7	12.2	293	292.6	15.3
54	53.9	02.8	114	113.8	06.0	174	173.8	09.1	234	233.7	12.2	294	293.6	15.4
55	54.9	02.9	115	114.8	06.0	175	174.8	09.2	235	234.7	12.3	295	294.6	15.4
56	55.9	02.9	116	115.8	06.1	176	175.8	09.2	236	235.7	12.3	296	295.6	15.5
57	56.9	03.0	117	116.8	06.1	177	176.8	09.3	237	236.7	12.4	297	296.6	15.5
58	57.9	03.0	118	117.8	06.2	178	177.8	09.3	238	237.7	12.5	298	297.6	15.6
59	58.9	03.1	119	118.8	06.2	179	178.8	09.4	239	238.7	12.5	299	298.6	15.6
60	59.9	03.1	120	110.8	06.3	180	179.8	09.4	240	239.7	12.6	300	299.6	15.7
Diſt.	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.

for 87 Degrees.

Difference of Latitude and Departure for 4 Degrees.

Dift.	Lat.	Dep.	Dift	Lat.	Dep.	Dift	Lat.	Dep.	Dift	Lat.	Dep.	Dift	Lat.	Dep.
1	01.0	00.1	61	60.9	04.3	121	120.7	08.4	181	180.6	02.6	241	240.4	16.8
2	02.0	00.1	62	61.9	04.3	122	121.7	08.5	182	181.6	02.7	242	241.4	16.9
3	03.0	00.2	63	62.8	04.4	123	122.7	08.6	183	182.6	02.8	243	242.4	16.9
4	04.0	00.3	64	63.8	04.5	124	123.7	08.6	184	183.6	02.8	244	243.4	17.0
5	05.0	00.5	65	64.8	04.5	125	124.7	08.7	185	184.6	02.9	245	244.4	17.1
6	06.0	00.4	66	65.8	04.6	126	125.7	08.8	186	185.6	03.0	246	245.4	17.1
7	07.0	00.5	67	66.8	04.7	127	126.7	08.9	187	186.6	03.0	247	246.4	17.2
8	08.0	00.6	68	67.8	04.7	128	127.7	08.9	188	187.5	03.1	248	247.4	17.3
9	09.0	00.6	69	68.8	04.8	129	128.7	09.0	189	188.5	03.2	249	248.4	17.4
10	10.0	00.7	70	69.8	04.9	130	129.7	09.1	190	189.5	03.2	250	249.4	17.4
11	11.0	00.8	71	70.8	05.0	131	130.7	09.1	191	190.5	13.3	251	250.4	17.5
12	12.0	00.8	72	71.8	05.0	132	131.7	09.2	192	191.5	13.4	252	251.4	17.6
13	13.0	00.9	73	72.8	05.1	133	132.7	09.3	193	192.5	13.5	253	252.4	17.6
14	14.0	01.0	74	73.8	05.2	134	133.7	09.3	194	193.5	13.5	254	253.4	17.7
15	15.0	01.0	75	74.8	05.2	135	134.7	09.4	195	194.5	13.6	255	254.4	17.8
16	16.0	01.1	76	75.8	05.3	136	135.7	09.5	196	195.5	13.7	256	255.4	17.8
17	17.0	01.2	77	76.8	05.4	137	136.7	09.5	197	196.5	13.7	257	256.4	17.9
18	18.0	01.3	78	77.8	05.4	138	137.7	09.6	198	197.5	13.8	258	257.4	18.0
19	19.0	01.3	79	78.8	05.5	139	138.7	09.7	199	198.5	13.9	259	258.4	18.1
20	20.0	01.4	80	79.8	05.6	140	139.7	09.8	100	199.5	13.9	260	259.4	18.1
21	20.9	01.5	81	80.8	05.7	141	140.7	09.8	101	200.5	14.0	261	260.4	18.2
22	21.9	01.5	82	81.8	05.7	142	141.7	09.9	102	201.5	14.1	262	261.4	18.3
23	22.9	01.6	83	82.8	05.8	143	142.7	10.0	103	202.5	14.1	263	262.4	18.3
24	23.9	01.7	84	83.8	05.9	144	143.7	10.0	104	203.5	14.2	264	263.4	18.4
25	24.9	01.7	85	84.8	05.9	145	144.7	10.1	105	204.5	14.3	165	264.4	18.5
26	25.9	01.8	86	85.8	06.0	146	145.6	10.2	106	205.5	14.4	266	265.4	18.5
27	26.9	01.9	87	86.8	06.1	147	146.6	10.2	107	206.5	14.4	267	266.4	18.6
28	27.9	02.0	88	87.8	06.1	148	147.6	10.3	108	207.5	14.5	268	267.4	18.7
29	28.9	02.0	89	88.8	06.2	149	148.6	10.4	109	208.5	14.6	269	268.4	18.7
30	29.9	02.1	90	89.8	06.3	150	149.6	10.5	110	209.5	14.6	270	269.4	18.8
31	30.9	02.2	91	90.8	06.4	151	150.6	10.5	211	210.5	14.7	271	270.3	18.9
32	31.9	02.2	92	91.8	06.4	152	151.6	10.6	212	211.5	14.8	272	271.3	19.0
33	32.9	02.3	93	92.8	06.5	153	152.6	10.7	213	212.5	14.8	273	272.3	19.0
34	33.9	02.4	94	93.8	06.6	154	153.6	10.7	214	213.5	14.9	274	273.3	19.1
35	34.9	02.4	95	94.8	06.6	155	154.6	10.8	215	214.5	15.0	275	274.3	19.2
36	35.9	02.5	96	95.8	06.7	156	155.6	10.9	216	215.5	15.1	276	275.3	19.2
37	36.9	02.6	97	96.8	06.8	157	156.6	10.9	217	216.5	15.1	277	276.3	19.3
38	37.9	02.7	98	97.8	06.8	158	157.6	11.0	218	217.5	15.2	278	277.3	19.4
39	38.9	02.7	99	98.8	06.9	159	158.6	11.1	219	218.5	15.3	279	278.3	19.4
40	39.9	02.8	100	99.8	07.0	160	159.6	11.2	220	219.5	15.3	280	279.3	19.5
41	40.9	02.9	101	100.8	07.0	161	160.6	11.2	221	220.5	15.4	281	280.3	19.6
42	41.9	02.9	102	101.8	07.1	162	161.6	11.3	222	221.5	15.5	282	281.3	19.7
43	42.9	03.0	103	102.8	07.2	163	162.6	11.4	223	222.5	15.5	283	282.3	19.7
44	43.9	03.1	104	103.8	07.2	164	163.6	11.4	224	223.5	15.6	284	283.3	19.8
45	44.9	03.1	105	104.7	07.3	165	164.6	11.5	225	224.5	15.7	285	284.3	19.9
46	45.9	03.2	106	105.7	07.4	166	165.6	11.6	226	225.5	15.8	286	285.3	19.9
47	46.9	03.3	107	106.7	07.5	167	166.6	11.6	227	226.5	15.8	287	286.3	20.0
48	47.9	03.4	108	107.7	07.5	168	167.6	11.7	228	227.5	15.9	288	287.3	20.1
49	48.9	03.4	109	108.7	07.6	169	168.6	11.8	229	228.5	16.0	289	288.3	20.1
50	49.9	03.5	110	109.7	07.7	170	169.6	11.8	230	229.4	16.0	290	289.3	20.2
51	50.9	03.6	111	110.7	07.7	171	170.6	11.9	231	2 0.4	16.1	291	290.3	20.3
52	51.9	03.6	112	111.7	07.8	172	171.6	12.0	232	231.4	16.2	292	291.3	20.4
53	52.9	03.7	113	112.7	07.9	173	172.6	12.1	233	232.4	16.2	293	292.3	20.4
54	53.9	03.8	114	113.7	07.9	174	173.6	12.1	234	233.4	16.3	294	293.3	20.5
55	54.9	03.8	115	114.7	08.0	175	174.6	12.2	235	234.4	16.4	295	294.3	20.6
56	55.9	03.9	116	115.7	08.1	176	175.6	12.3	236	235.4	16.4	296	295.3	20.6
57	56.9	04.0	117	116.7	08.2	177	176.6	12.3	237	236.4	16.5	297	296.3	20.7
58	57.9	04.0	118	117.7	08.2	178	177.6	12.4	238	237.4	16.6	298	297.3	20.8
59	58.9	04.1	119	118.7	08.3	179	178.6	12.5	239	238.4	16.7	299	298.3	20.8
60	59.9	04.2	120	119.7	08.4	180	179.6	12.5	240	239.4	16.7	300	299.3	20.9
Dift.	Dep.	Lat.	Dift	Dep.	Lat.	Dift	Dep.	Lat.	Dift	Dep.	Lat.	Dift	Dep.	Lat.

for 86 Degrees.

Difference of Latitude and Departure for 5 Degrees.

Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.
1	01.0	00.1	61	60.8	05.3	121	120.5	10.5	181	180.3	15.7	241	240.1	21.0
2	02.0	00.2	62	61.8	05.4	122	121.5	10.6	182	181.3	15.8	242	241.1	21.1
3	03.0	00.3	63	62.8	05.5	123	122.5	10.7	183	182.3	15.9	243	242.1	21.1
4	04.0	00.3	64	63.8	05.6	124	123.5	10.8	184	183.3	16.0	244	243.1	21.2
5	05.0	00.4	65	64.8	05.7	125	124.5	10.9	185	184.3	16.1	245	244.1	21.3
6	06.0	00.5	66	65.7	05.8	126	125.5	11.0	186	185.3	16.2	246	245.1	21.4
7	07.0	00.6	67	66.7	05.8	127	126.5	11.0	187	186.3	16.3	247	246.1	21.5
8	08.0	00.7	68	67.7	03.9	128	127.5	11.1	188	187.3	16.4	248	247.1	21.6
9	09.0	00.8	69	68.7	06.0	129	128.5	11.2	189	188.3	16.4	249	248.1	21.7
10	10.0	00.9	70	69.7	06.1	130	129.5	11.3	190	189.3	16.5	250	249.1	21.8
11	11.0	01.0	71	70.7	06.2	131	130.5	11.4	191	190.3	16.6	251	250.0	21.8
12	12.0	01.0	72	71.7	06.3	132	131.5	11.5	192	191.3	16.7	252	251.0	21.9
13	12.9	01.1	73	72.7	06.4	133	132.5	11.6	193	192.3	16.8	253	252.0	22.0
14	13.9	01.2	74	73.7	06.5	134	133.5	11.7	194	193.3	16.9	254	253.0	22.1
15	14.9	01.3	75	74.7	06.5	135	134.5	11.7	195	194.3	17.0	255	254.0	22.2
16	15.9	01.4	76	75.7	06.6	136	135.5	11.8	196	195.3	17.1	256	255.0	22.3
17	16.9	01.5	77	76.7	06.7	137	136.5	11.9	197	196.3	17.1	257	256.0	22.4
18	17.9	01.6	78	77.7	06.8	138	137.5	12.0	198	197.2	17.2	258	257.0	22.4
19	18.9	01.7	79	78.7	06.9	139	138.5	12.1	199	198.2	17.3	259	258.0	22.5
20	19.9	01.7	80	79.7	07.0	140	139.5	12.2	200	199.2	17.4	260	259.0	22.6
21	20.9	01.8	81	80.7	07.1	141	140.5	12.3	201	200.2	17.5	261	260.0	22.7
22	21.9	01.9	82	81.7	07.2	142	141.5	12.4	202	201.2	17.6	262	261.0	22.8
23	22.9	02.0	83	82.7	07.2	143	142.5	12.4	203	202.2	17.7	263	262.0	22.9
24	23.9	02.1	84	83.7	07.3	144	143.5	12.5	204	203.2	17.7	264	263.0	23.0
25	24.9	02.2	85	84.7	07.4	145	144.4	12.6	205	204.2	17.8	265	264.0	23.1
26	25.9	02.3	86	85.7	07.5	146	145.4	12.7	206	205.2	17.9	266	265.0	23.1
27	26.9	02.4	87	86.7	07.6	147	146.4	12.8	207	206.2	18.0	267	266.0	23.2
28	27.9	02.4	88	87.7	07.7	148	147.4	12.9	208	207.2	18.1	268	267.0	23.3
29	28.9	02.5	89	88.7	07.8	149	148.4	13.0	209	208.2	18.2	269	268.0	23.4
30	29.9	02.6	90	89.7	07.8	150	149.4	13.1	210	209.2	18.3	270	269.0	23.5
31	30.9	02.7	91	90.7	07.9	151	150.4	13.1	211	210.2	18.4	271	270.0	23.6
32	31.9	02.8	92	91.6	08.0	152	151.4	13.2	212	211.2	18.4	272	271.0	23.7
33	32.9	02.9	93	92.6	08.1	153	152.4	13.3	213	212.2	18.5	273	272.0	23.8
34	33.9	03.0	94	93.6	08.2	154	153.4	13.4	214	213.2	18.6	274	273.0	23.8
35	34.9	03.1	95	94.6	08.3	155	154.4	13.5	215	214.2	18.7	275	274.0	23.9
36	35.9	03.1	96	95.6	08.4	156	155.4	13.6	216	215.2	18.8	276	275.0	24.0
37	36.9	03.2	97	96.6	08.5	157	156.4	13.7	217	216.2	18.9	277	275.9	24.1
38	37.9	03.3	98	97.6	08.5	158	157.4	13.7	218	217.2	19.0	278	276.9	24.2
39	38.9	03.4	99	98.6	08.6	159	158.4	13.8	219	218.2	19.1	279	277.9	24.3
40	39.8	03.5	100	99.6	08.7	160	159.4	13.9	220	219.2	19.1	280	278.9	4.4
41	40.8	03.6	101	100.6	08.8	161	160.4	14.0	221	220.2	19.2	281	279.9	24.4
42	41.8	03.7	102	101.6	08.9	162	161.4	14.1	222	221.2	19.3	282	280.9	24.5
43	42.8	03.8	103	102.6	09.0	163	162.4	14.2	223	222.2	19.4	283	281.9	24.6
44	43.8	03.8	104	103.6	09.0	164	163.4	14.3	224	223.1	19.5	284	282.9	24.7
45	44.8	03.9	105	104.6	09.1	165	164.4	14.4	225	224.1	19.6	285	283.9	24.8
46	45.8	04.0	106	105.6	09.2	166	165.4	14.4	226	225.1	19.7	286	284.9	24.9
47	46.8	04.1	107	106.6	09.3	167	166.4	14.5	227	226.1	19.7	287	285.9	25.0
48	47.8	04.2	108	107.6	09.4	168	167.4	14.6	228	227.1	19.8	288	286.9	25.1
49	48.8	04.3	109	108.6	09.5	169	168.4	14.7	229	228.1	19.9	289	287.9	25.1
50	49.8	04.4	110	109.6	09.6	170	169.4	14.8	230	229.1	20.0	290	288.9	25.2
51	50.8	04.4	111	110.6	10.7	171	170.4	14.9	231	230.1	20.1	291	289.9	25.3
52	51.8	04.5	112	111.6	10.7	172	171.3	15.0	232	231.1	20.2	292	290.9	25.4
53	52.8	04.6	113	112.6	10.8	173	172.3	15.1	233	232.1	20.3	293	291.9	25.5
54	53.8	04.7	114	113.6	10.9	174	173.3	15.1	234	233.1	20.4	294	292.9	25.6
95	54.8	04.8	115	114.6	10.0	175	174.3	15.2	235	234.1	20.4	295	293.9	25.7
56	55.8	04.9	116	115.6	10.1	176	175.3	15.3	236	235.1	20.5	296	294.9	25.8
57	56.8	05.0	117	116.6	10.2	177	176.3	15.4	237	236.1	20.6	297	295.9	25.8
58	57.8	05.1	118	117.6	10.3	178	177.3	15.5	238	237.1	20.7	298	296.9	25.9
59	58.8	05.1	119	118.5	10.4	179	178.3	15.6	239	238.1	20.8	299	297.9	26.0
60	59.8	05.2	120	119.5	10.4	180	179.3	15.7	240	239.1	20.9	300	298.9	26.1
Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.

for 85 Degrees.

Difference of Latitude and Departure for 6 Degrees.

Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.
1	01.0	00.1	61	60.7	06.4	121	120.3	12.6	181	180.0	18.9	241	239.7	25.2
2	02.0	00.2	62	61.7	06.5	122	121.3	12.7	182	181.0	19.0	242	240.7	25.3
3	03.0	00.3	63	62.7	06.6	123	122.3	12.9	183	182.0	19.1	243	241.7	25.4
4	04.0	00.4	64	63.6	06.7	124	123.3	13.0	184	18 .0	19.2	244	242.7	25.5
5	05.0	00.5	65	64.6	06.8	125	124.3	13.1	185	184.0	19.3	245	243.7	25.6
6	06.0	00.6	66	65.6	06.9	126	125.3	13.2	186	185.0	19.4	246	244.6	25.7
7	07.0	00.7	67	66.6	07.0	127	126.3	13.3	187	186.0	19.5	247	245.6	25.8
8	08.0	00.8	68	67.6	07.1	128	127.3	13.4	188	187.0	19.6	248	246.6	25.9
9	08.9	00.9	69	68.6	07.2	129	128.3	13.5	189	188.0	19.8	249	247.6	26.0
10	09.9	01.0	70	69.6	07.3	130	129.3	13.6	190	189.0	19.9	250	248.6	26.1
11	10.9	01.1	71	70.6	07.4	131	130.3	13.7	191	189.9	20.0	251	249.6	26.2
12	11.9	01.3	72	71.6	07.5	132	131.3	13.8	192	190.9	20.1	252	250.6	26.3
13	12.9	01.4	73	72.6	07.6	133	132.3	13.9	193	191.9	20.2	253	251.6	26.4
14	13.9	01.5	74	73.6	07.7	134	133.3	14.0	194	192.9	20.3	254	252.6	26.5
15	14.9	01.6	75	74.6	07.8	135	134.3	14.1	195	193.9	20.4	255	253.6	26.6
16	15.9	01.7	76	75.6	07.9	136	135.3	14.2	196	194.9	20.5	256	254.6	26.8
17	16.9	01.8	77	76.6	08.0	137	136.2	14.3	197	195.9	20.6	257	255.6	26.9
18	17.9	01.9	78	77.6	08.1	138	133.2	14.4	198	196.9	20.7	258	256.6	27.0
19	18.9	02.0	79	78.6	08.3	139	138.2	14.5	199	197.9	20.8	259	257.6	27.1
20	19.9	02.1	80	79.6	08.4	140	139.2	14.6	200	198.9	20.9	260	258.6	27.2
21	20.9	02.2	81	80.6	08.5	141	140.2	14.7	201	199.9	21.0	261	259.6	27.3
22	21.9	02.3	82	81.5	08.6	142	141.2	14.8	202	200.	21.1	262	260.6	27.4
23	22.9	02.4	83	82.5	08.7	143	142.2	14.9	203	201.9	21.2	263	261.6	27.5
24	23.9	02.5	84	83.5	08.8	144	143.2	15.0	204	202.9	21.3	264	262.5	27.6
25	24.9	02.6	85	84.5	08.9	145	144.2	15.2	205	203.9	21.4	265	263.5	27.7
26	25.9	02.7	86	85.5	09.0	146	145.2	15.3	206	204.9	21.5	266	264.5	27.8
27	26.9	02.8	87	86.5	09.1	147	146.2	15.4	207	205.9	21.6	267	265.5	27.9
28	27.9	02.9	88	87.5	09.2	148	147.2	15.5	208	206.9	21.7	268	266.5	28.0
29	28.8	03.0	89	88.5	09.3	149	148.2	15.6	209	207.9	21.8	269	267.5	28.1
30	29.8	03.1	90	89.5	09.4	150	149.2	15.7	210	208.8	21.9	270	268.5	28.2
31	30.8	03.2	91	90.5	09.5	151	150.2	15.8	211	209.8	22.0	271	269.5	28.3
32	31.8	03.3	92	91.5	09.6	152	151.2	15.9	212	210.8	22.1	272	270.5	28.4
33	32.8	03.4	93	92.5	09.7	153	152.2	16.0	213	211.8	22.3	273	271.5	28.5
34	33.8	03.6	94	93.5	09.8	154	153.2	16.1	214	212.8	22.4	274	272.5	28.6
35	34.8	03.7	95	94.5	09.9	155	154.1	16.2	215	213.8	22.5	275	273.5	28.7
36	35.8	03.8	96	95.5	10.0	156	155.1	16.3	216	214.8	22.6	276	274.5	28.8
37	36.8	03.9	97	96.5	10.1	157	156.1	16.4	217	215.8	22.7	277	275.5	28.9
38	37.8	04.0	98	97.5	10.2	158	157.1	16.5	218	216.8	22.8	278	276.5	29.1
39	38.8	04.1	99	98.5	10.3	159	158.1	16.6	219	217.8	22.9	279	277.5	29.2
40	39.8	04.2	100	99.5	10.5	160	159.1	16.7	220	218.8	23.0	280	278.5	29.3
41	40.8	04.3	101	100.4	10.6	161	160.1	16.8	221	219.8	23.1	281	279.4	29.4
42	41.8	04.4	102	101.4	10.7	162	161.1	16.9	222	220.8	23.2	282	280.4	29.5
43	42.8	04.5	103	102.4	10.8	163	162.1	17.0	223	221.8	23.3	283	281.4	29.6
44	43.8	04.6	104	103.4	10.9	164	163.1	17.1	224	222.8	23.4	284	282.4	29.7
45	44.8	04.7	105	104.4	11.0	165	164.1	17.2	225	223.8	23.5	285	283.4	29.8
46	45.8	04.8	106	105.4	11.1	166	165.1	17.3	226	224.8	23.6	286	284.4	29.9
47	46.7	04.9	107	106.4	11.2	167	166.1	17.5	227	225.8	23.7	287	285.4	30.0
48	47.7	05.0	108	107.4	11.3	168	167.1	17.6	228	226.7	23.8	288	286.4	30.1
49	48.7	05.1	109	108.4	11.4	169	168.1	17.7	229	227.7	23.9	289	287.4	30.2
50	49.7	05.2	110	109.4	11.5	170	169.1	17.8	230	228.7	24.0	290	288.4	30.3
51	50.7	05.3	111	110.4	11.6	171	170.1	17.9	231	229.7	24.1	291	289.4	30.4
52	51.7	05.4	112	111.4	11.7	172	171.1	18.0	232	230.7	24.2	292	290.4	30.5
53	52.7	05.5	113	112.4	11.8	173	172.0	18.1	233	231.7	24.3	293	291.4	30.6
54	53.7	05.6	114	113.4	11.9	174	173.0	18.2	234	232.7	24.5	294	292.4	30.7
55	54.7	05.7	115	114.4	12.0	175	174.0	18.3	235	233.7	24.6	295	293.4	30.8
56	55.7	05.9	116	115.4	12.1	176	175.0	18.4	236	234.7	24.7	296	294.4	30.9
57	56.7	06.0	117	116.4	12.2	177	176.0	18.5	237	235.7	24.8	297	295.4	31.0
58	57.7	06.1	118	117.4	12.3	178	177.0	18.6	238	236.7	24.9	298	296.4	31.1
59	58.7	06.2	119	118.3	12.4	179	178.0	18.7	239	237.7	25.0	299	297.4	31.2
60	59.7	06.3	120	119.3	12.5	180	179.0	18.8	240	238.7	25.1	300	298.4	31.4
Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.

For 84 Degrees.

Difference of Latitude and Departure for 7 Degrees.

Dift.	Lat.	Dep.	Dift	Lat.	Dep.	Dift	Lat.	Dep.	Dift	Lat.	Dep.	Dift	Lat.	Dep
1	01.0	00.1	61	60.5	07.4	121	120.1	14.7	181	179.6	22.0	241	239.2	29.3
2	02.0	00.2	62	61.5	07.5	122	121.1	14.9	182	180.6	22.2	242	240.2	29.5
3	03.0	00.4	63	62.5	07.7	123	122.1	15.0	183	181.6	22.3	243	241.2	29.6
4	04.0	00.5	64	63.5	07.8	124	113.1	15.1	184	182.6	22.4	244	242.2	29.7
5	05.0	00.6	65	64.5	07.9	125	124.1	15.2	185	183.6	22.5	245	243.2	29.8
6	06.0	00.7	66	65.5	08.0	126	125.1	15.3	186	184.6	22.7	246	244.1	29.9
7	06.9	00.9	67	66.5	08.2	127	126.0	15.5	187	185.6	22.8	247	245.1	30.1
8	07.9	01.0	68	67.5	08.3	128	127.0	15.6	188	186.6	22.9	248	246.1	30.2
9	08.9	01.1	69	68.5	08.4	129	128.0	15.7	189	187.6	23.0	249	247.1	30.3
10	09.9	01.2	70	69.5	08.5	130	129.0	15.8	190	188.6	23.1	250	248.1	30.4
11	10.9	01.3	71	70.5	08.6	131	130.0	16.0	191	189.6	23.3	251	249.1	30.6
12	11.9	01.5	72	71.5	08.8	132	131.0	16.1	192	190.6	23.4	252	250.1	30.7
13	12.9	01.6	73	72.5	08.9	133	132.0	16.2	193	191.6	23.5	253	251.1	30.8
14	13.9	01.7	74	73.4	09.0	134	133.0	16.3	194	192.5	23.6	254	252.1	30.9
15	14.9	01.8	75	74.4	09.2	135	134.9	16.4	195	193.5	23.7	255	253.1	31.0
16	15.9	01.9	76	75.4	09.3	136	135.0	16.6	196	194.5	23.9	256	254.1	31.2
17	16.9	02.1	77	76.4	09.4	137	136.0	16.7	197	195.5	24.0	257	255.1	31.3
18	17.9	02.2	78	77.4	09.5	138	137.0	16.8	198	196.5	24.1	258	256.1	31.4
19	18.9	02.3	79	78.4	09.6	139	138.0	16.9	199	197.5	24.2	259	257.1	31.5
20	19.9	02.4	80	79.4	09.7	140	139.0	17.1	200	198.5	24.4	260	258.1	31.7
21	20.8	02.6	81	80.4	09.9	141	139.9	17.2	201	199.5	24.5	261	259.0	31.8
22	21.8	02.7	82	81.4	10.0	142	140.9	17.3	202	200.5	24.6	262	260.0	31.9
23	22.8	02.8	83	82.4	10.1	143	141.9	17.4	203	201.5	24.7	263	261.0	32.0
24	23.8	02.9	84	83.4	10.2	144	142.9	17.5	204	202.5	24.8	264	262.0	32.1
25	24.8	03.0	85	84.4	10.4	145	143.9	17.7	205	203.5	25.0	265	263.0	32.3
26	25.8	03.2	86	85.4	10.5	146	144.9	17.8	206	204.5	25.1	266	264.0	32.4
27	26.8	03.3	87	86.3	10.6	147	145.9	17.9	207	205.4	25.2	267	265.0	32.5
28	27.8	03.4	88	87.3	10.7	148	146.9	18.0	208	206.4	25.3	268	266.0	32.6
29	28.8	03.5	89	88.3	10.8	149	147.9	18.1	209	207.4	25.4	269	267.0	32.8
30	29.8	03.7	90	89.3	11.0	150	148.9	18.3	210	208.4	25.6	270	264.0	32.9
31	30.8	03.8	91	90.3	11.1	151	149.9	18.4	211	209.4	25.7	271	269.0	33.0
32	31.8	03.9	92	91.3	11.2	152	150.9	18.5	212	210.4	25.8	272	270.0	33.1
33	32.8	04.0	93	92.3	11.3	153	151.9	18.6	213	211.4	25.9	273	271.0	33.2
34	33.7	04.1	94	93.3	11.5	154	152.8	18.7	214	212.4	26.1	274	271.9	33.4
35	34.7	04.3	95	94.3	11.6	155	153.8	18.9	215	213.4	26.2	275	272.9	33.5
36	35.7	04.4	96	95.3	11.7	156	154.8	19.0	216	214.4	26.3	276	273.9	33.6
37	36.7	04.5	97	96.3	11.8	157	155.8	19.1	217	215.4	26.4	277	274.9	33.7
38	37.7	04.6	98	97.3	11.9	158	156.8	19.2	218	216.4	26.5	278	275.9	33.9
39	38.7	04.8	99	98.3	12.1	159	157.8	19.4	219	217.4	26.7	279	276.9	34.0
40	39.7	04.9	100	99.3	12.2	160	158.8	19.5	220	218.4	26.8	280	277.9	34.1
41	40.7	05.0	101	100.2	12.3	161	159.8	19.6	221	219.3	26 9	281	278.9	34.2
42	41.7	05.1	102	101.2	12.4	162	166.8	19.7	222	220.3	27.0	282	279.9	34.3
43	42.7	05.2	103	102.2	12.5	163	161.8	19.8	223	221.3	27.2	283	280.9	34.5
44	43.7	05.4	104	103.2	12.7	164	162.8	20.0	224	212.3	27.3	284	281.9	34.6
45	44.7	05.5	105	104.2	12.8	165	163.8	20.1	225	223.3	27.4	285	282.9	34.7
46	45.7	05.6	106	105.2	12.9	166	164.8	20.2	226	224.3	27.5	286	283.9	34.8
47	46.6	05.7	107	106.2	13.0	167	165.7	20.3	227	225.3	27.6	287	284.8	34.9
48	47.6	05.8	108	107.2	13.1	168	166.7	20.5	228	226.3	27.8	288	285.8	35.1
49	48.6	06.0	109	108.2	13.3	169	167.7	20.6	229	227.3	27.9	289	286.8	35.2
50	49.6	06.1	110	109.2	13.4	170	168.7	20.7	230	228.3	28.0	290	287.8	35.3
51	50.6	06.2	111	110.2	13.5	171	169.7	20.8	231	229.3	28.1	291	288.8	35.4
52	51.6	06.3	112	111.2	13.6	172	170.7	20.9	232	230.3	28.3	292	289.8	35.5
53	52.6	06.5	113	112.2	13.8	173	171.7	21.1	233	231.3	28.4	293	290.8	35.7
54	53.6	06.6	114	113.1	13.9	174	172.7	21.2	234	232.2	28.5	294	291.8	35.8
55	54.6	06.7	115	114.1	14.0	175	173.7	21.3	235	233.2	28.6	295	292.8	35.9
56	55.6	06.8	116	115.1	14.1	176	174.7	21.4	236	234.2	28.7	296	293.8	36.0
57	56.6	06.9	117	116.1	14.2	177	175.7	21.6	237	235.2	28.9	297	294.8	36.2
58	57.6	07.1	118	117.1	14.4	178	276.7	21.7	238	236.2	29.0	298	295.8	36.3
59	58.6	07.2	119	118.1	14.5	179	277.7	21.8	239	237.2	29.1	299	296.8	36.4
60	59.6	07.3	120	119.1	14.6	180	278.7	21.9	240	238.2	29 2	300	297.8	36.5
Dift.	Dep	Lat.	Dift	Dep.	Lat.	Dift	Dep.	Lat.	Dift	Dep.	Lat.	Dift	Dep.	Lat.

for 83 Degrees.

Difference of Latitude and Departure for 8 Degrees.

Diſt.	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.
1	01.0	00.1	61	60.4	08.5	121	119.8	16.8	181	179.2	25.2	241	238.7	33.5
2	02.0	00.3	62	61.4	08.6	122	120.8	17.0	182	180.2	25.3	242	239.7	33.7
3	03.0	00.4	63	62.4	08.8	123	121.8	17.1	183	181.2	25.5	243	240.6	33.8
4	04.0	00.6	64	63.4	08.9	124	122.8	17.3	184	182.2	25.6	244	241.6	34.0
5	05.9	00.7	65	64.4	09.0	125	123.8	17.4	185	183.2	25.8	245	242.6	34.1
6	05.9	00.8	66	65.4	09.2	126	124.8	17.5	186	184.2	25.9	246	243.6	34.2
7	06.9	01.0	67	66.4	09.3	127	125.8	17.7	187	185.2	26.0	247	244.6	34.4
8	07.9	01.1	68	67.3	09.5	128	126.8	17.8	188	186.2	26.2	248	245.6	34.5
9	08.9	01.3	69	68.3	09.6	129	127.7	18.0	189	187.2	26.3	249	246.6	34.7
10	09.9	01.4	70	69.3	09.7	130	128.7	18.1	190	188.2	26.4	250	247.6	34.8
11	10.9	01.5	71	70.3	09.9	131	129.7	18.2	191	189.1	26.6	251	248.6	34.9
12	11.9	01.7	72	71.3	10.0	132	130.7	18.4	192	190.1	26.7	252	249.6	35.1
13	12.9	01.8	73	72.3	10.2	133	131.7	18.5	193	191.1	26.9	253	250.5	35.2
14	13.9	01.9	74	73.3	10.3	134	132.7	18.7	194	192.1	27.0	254	251.5	35.4
15	14.9	02.1	75	74.3	10.4	135	133.7	18.8	195	193.1	27.1	255	252.5	35.5
16	15.8	02.2	76	75.3	10.6	136	134.7	18.9	196	194.1	27.3	256	253.5	35.6
17	16.8	02.4	77	76.3	10.7	137	135.7	19.1	197	195.1	27.4	257	254.5	35.8
18	17.8	02.5	78	77.2	10.9	138	136.7	19.2	198	196.1	27.6	258	255.5	35.9
19	18.8	02.6	79	78.2	11.0	139	137.7	19.3	199	197.1	27.7	259	256.5	36.1
20	19.8	02.8	80	79.2	11.1	140	138.6	19.5	200	198.1	27.8	260	257.5	36.2
21	20.8	02.9	81	80.2	11.3	141	139.6	19.6	201	199.0	28.0	261	258.5	36.3
22	21.8	03.1	82	81.2	11.4	142	140.6	19.8	202	200.0	28.1	262	259.5	36.5
23	22.8	03.2	83	82.2	11.6	143	141.6	19.9	203	201.0	28.3	263	260.4	36.6
24	23.8	03.3	84	83.2	12.7	144	142.6	20.0	204	202.0	28.4	264	261.4	36.7
25	24.8	93.5	85	84.2	11.8	145	143.6	20.2	205	203.0	28.5	265	262.4	36.9
26	25.7	03.6	86	85.2	12.0	146	144.6	20.3	206	204.0	28.7	266	263.4	37.0
27	26.7	03.8	87	86.2	12.1	147	145.6	20.5	207	205.0	28.8	267	264.4	37.2
28	27.7	03.9	88	87.1	12.2	148	146.6	20.6	208	206.0	29.0	268	265.4	37.3
29	28.7	04.0	89	88.1	12.4	149	147.6	20.7	209	207.0	29.1	269	266.4	37.4
30	29.7	04.2	90	89.1	12.5	150	148.5	20.9	210	208.0	29.2	279	267.4	37.6
31	30.7	04.3	91	90.1	12.7	151	149.5	21.0	211	209.0	29.4	271	268.4	37.7
32	31.7	04.5	92	91.1	12.8	152	150.5	21.2	212	209.9	29.5	272	269.4	37.9
33	32.7	04.6	93	92.1	12.9	153	151.5	21.3	213	210.9	29.6	273	270.4	38.0
34	33.7	04.7	94	93.1	13.1	154	152.5	21.4	214	211.9	29.8	274	271.3	38.1
35	34.7	04.9	95	94.1	13.2	155	153.5	21.6	215	212.9	29.9	275	272.3	38.3
36	35.7	05.0	96	95.1	13.4	156	154.5	21.7	216	213.9	20.1	276	273.3	38.4
37	36.6	05.2	97	96.1	13.5	157	155.5	21.9	217	214.9	30.2	277	274.3	38.6
38	37.6	05.4	98	97.0	13.6	158	156.5	22.0	218	215.9	30.3	278	275.3	38.7
39	38.6	05.5	99	98.0	13.8	159	157.5	22.1	219	216.9	30.5	279	276.3	38.8
40	39.6	05.6	100	99.0	13.9	160	158.4	22.3	220	217.9	30.6	280	277.3	39.0
41	40.6	05.7	101	100.0	14.1	161	159.4	22.4	221	218.9	30.8	281	278.3	39.1
42	41.6	05.8	102	101.0	14.2	162	160.4	22.6	222	219.8	30.9	282	279.3	39.3
43	42.6	06.0	103	102.0	14.3	163	161.4	22.7	223	220.8	31.0	283	280.3	39.4
44	43.6	06.1	104	103.0	14.5	164	162.4	22.8	224	221.8	31.2	284	281.2	39.5
45	44.6	06.3	105	104.0	14.6	165	163.4	23.0	225	222.8	31.3	285	282.2	39.7
46	45.6	06.4	106	105.0	14.8	166	164.4	23.1	226	223.8	31.5	286	283.2	39.8
47	46.5	06.5	107	106.0	14.9	167	165.4	23.2	227	224.8	31.6	287	284.2	40.0
48	47.5	06.7	108	107.0	15.0	168	166.4	23.4	228	225.8	31.7	288	285.2	40.1
49	48.5	06.8	109	107.9	15.2	169	167.4	23.5	229	226.8	31.9	289	286.2	40.2
50	49.5	07.0	110	108.9	15.3	170	168.4	23.7	230	227.8	32.0	290	287.2	40.4
51	50.5	07.1	111	109.9	15.5	171	169.3	23.8	231	228.8	32.2	291	288.2	40.5
52	51.5	07.2	112	110.9	15.6	172	170.3	23.9	232	229.7	32.3	292	289.2	40.6
53	52.5	07.4	113	111.9	15.7	173	171.3	24.1	233	230.7	32.4	293	290.2	40.8
54	53.5	07.5	114	112.9	15.9	174	172.3	24.2	234	231.7	32.6	294	291.1	40.9
55	54.5	07.7	115	113.9	16.0	175	173.3	24.4	235	232.7	32.7	295	292.1	41.1
56	55.5	07.8	116	114.9	16.1	176	174.3	24.5	236	233.7	32.9	296	293.1	41.2
57	56.4	07.9	117	115.9	16.3	177	175.3	24.6	237	234.7	33.0	297	294.1	41.3
58	57.4	08.1	118	116.9	16.4	178	176.3	24.7	238	235.7	33.1	298	295.1	41.5
59	58.4	08.2	119	117.8	16.6	179	177.3	24.9	239	236.7	33.3	299	296.1	41.6
60	59.4	08.4	120	118.8	16.7	180	178.3	25.1	240	437.7	33.4	300	297.1	41.8
Diſt.	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.

for 82 Degrees.

N 2

Difference of Latitude and Departure for 9 Degrees.

Diſt.	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.
1	01.0	00.2	61	60.2	09.5	121	119.5	18.9	181	178.8	28.3	241	238.0	37.7
2	02.0	00.3	62	61.2	09.7	122	120.5	19.1	182	179.8	28.5	242	239.0	37.8
3	03.0	00.5	63	62.2	09.9	123	121.5	19.2	183	180.7	38.6	243	240.0	38.0
4	04.0	00.6	64	63.2	10.0	124	122.5	19.4	184	181.7	28.8	244	241.0	38.2
5	04.9	00.8	65	64.2	10.2	125	123.5	19.6	185	182.7	28.9	245	242.0	38.3
6	05.9	00.9	66	65.2	10.3	126	124.5	19.7	186	183.7	29.1	246	243.0	38.5
7	06.9	01.1	67	66.2	10.5	127	125.4	19.9	187	184.7	29.2	247	244.0	38.6
8	07.9	01.3	68	67.2	10.6	128	126.4	20.0	188	185.7	29.4	248	244.9	38.8
9	08.9	01.4	69	68.2	10.8	129	127.4	20.2	189	186.7	29.6	249	245.9	38.9
10	09.9	01.6	70	69.1	10.9	130	128.4	20.3	190	187.7	29.7	250	246.9	39.1
11	10.9	01.7	71	70.1	11.1	131	129.4	20.5	191	188.7	29.9	251	247.9	39.3
12	11.9	01.9	72	71.1	11.3	132	130.4	20.6	192	189.6	30.0	252	248.9	39.4
13	12.9	02.0	73	72.1	11.4	133	131.4	20.8	193	190.6	30.2	253	249.9	39.6
14	13.8	02.2	74	73.1	11.6	134	132.4	21.0	194	191.6	30.3	254	250.9	39.7
15	14.8	02.3	75	74.1	11.7	135	133.3	21.1	195	192.6	30.5	255	251.9	39.9
16	15.8	02.5	76	75.1	11.9	136	134.3	21.3	196	193.6	30.7	256	252.9	40.0
17	16.8	02.7	77	76.1	12.0	137	135.3	21.4	197	194.6	30.8	257	253.8	40.2
18	17.8	02.8	78	77.0	12.2	148	136.3	21.6	198	195.6	31.0	258	254.8	40.4
19	18.8	03.0	79	78.0	12.4	139	137.3	21.7	199	196.6	31.1	259	255.8	40.5
20	19.8	03.1	80	79.0	12.5	140	138.3	21.9	200	197.5	31.3	260	256.8	40.7
21	20.7	03.3	81	80.0	12.7	141	139.3	22.1	201	198.5	31.4	261	257.8	40.8
22	21.7	03.4	82	81.0	12.8	142	140.3	22.2	202	199.5	31.6	262	258.8	41.0
23	22.7	03.6	83	82.0	13.0	143	141.2	22.4	203	200.5	31.7	263	259.8	41.1
24	23.7	03.8	84	83.0	13.1	144	142.2	22.5	204	201.5	31.9	264	260.8	41.3
25	24.7	03.9	85	84.0	13.3	145	143.2	22.7	205	202.5	32.1	265	261.7	41.4
26	25.7	04.1	86	84.9	13.5	146	144.2	22.8	206	203.5	32.2	266	262.7	41.6
27	26.7	04.2	87	85.9	13.6	147	145.2	23.0	207	204.5	32.4	267	263.7	41.8
28	27.7	04.4	88	86.9	13.8	148	146.2	23.1	208	205.4	32.5	268	264.7	41.9
29	28.6	04.5	89	87.9	13.9	149	147.2	23.3	209	206.4	32.7	269	265.7	42.1
30	29.6	04.7	90	88.9	14.1	150	148.2	23.5	210	207.4	32.8	270	266.7	42.2
31	30.6	04.8	91	89.9	14.2	151	149.1	23.6	211	208.4	33.0	271	267.7	42.4
32	31.6	05.0	92	90.9	14.4	152	150.1	23.8	212	209.4	33.2	272	268.7	42.5
33	32.6	05.2	93	91.9	14.5	153	151.1	23.9	213	210.4	33.3	273	269.6	42.7
34	33.6	05.3	94	92.8	14.7	154	152.1	24.1	214	211.4	33.5	274	270.6	42.9
35	34.6	05.5	95	93.8	14.9	155	153.1	24.2	215	212.4	33.6	275	271.6	43.0
36	35.6	05.6	96	94.8	15.0	156	154.1	24.4	216	213.3	33.8	276	272.6	43.2
37	36.5	05.8	97	95.8	15.2	157	155.1	24.6	217	214.3	33.9	277	273.6	43.3
38	37.5	05.9	98	96.8	15.3	158	156.1	24.7	218	215.3	34.1	278	274.6	43.5
39	38.5	06.1	99	97.8	15.5	159	157.0	24.9	219	216.3	34.3	279	275.6	43.6
40	39.5	06.3	100	98.8	15.6	160	158.0	25.0	220	217.3	34.4	280	276.6	43.8
41	40.5	06.4	101	99.8	15.8	161	159.0	25.2	221	218.3	34.6	281	277.5	43.9
42	41.5	06.6	102	100.7	16.0	162	160.0	25.3	222	219.3	34.7	282	278.5	44.1
43	42.5	06.7	103	101.7	16.1	163	161.0	25.5	223	220.3	34.9	283	279.5	44.3
44	43.5	06.9	104	102.7	16.3	164	162.0	25.6	224	221.2	35.0	284	280.5	44.4
45	44.4	07.0	105	103.7	16.4	165	163.0	25.8	225	222.2	35.2	285	281.5	44.6
46	45.4	07.2	106	104.7	16.6	166	164.0	26.0	226	223.2	35.3	286	282.5	44.7
47	46.4	07.4	107	105.7	16.7	167	164.9	26.1	227	224.2	35.5	287	283.5	44.9
48	47.4	07.5	108	106.7	16.9	168	165.9	26.3	228	225.2	35.7	288	284.5	45.0
49	48.4	07.7	109	107.7	17.0	169	166.9	26.4	229	226.2	35.8	289	285.4	45.2
50	49.4	07.8	110	108.6	17.2	170	167.9	26.6	230	227.2	36.0	290	286.4	45.4
51	50.4	08.0	111	109.6	17.4	171	168.9	26.7	231	228.2	36.1	291	287.4	45.5
52	51.4	08.1	112	110.6	17.5	172	169.9	26.9	232	229.1	36.3	292	288.4	45.7
53	52.3	08.3	113	111.6	17.7	173	170.9	27.1	233	230.1	36.4	293	289.4	45.8
54	53.3	08.4	114	112.6	17.8	174	171.9	27.2	234	231.1	36.6	294	290.4	46.0
55	54.3	08.6	115	113.6	18.0	175	172.8	27.4	235	232.1	36.8	295	291.4	46.1
56	55.3	08.8	116	114.6	18.1	176	173.8	27.5	236	233.1	36.9	296	292.4	46.3
57	56.3	08.9	117	115.6	18.3	177	174.8	27.7	237	234.1	37.1	297	293.3	46.5
58	57.3	09.1	118	116.5	18.5	178	175.8	27.8	238	235.1	37.2	298	294.3	46.6
59	58.3	09.2	119	117.5	18.6	179	176.8	28.0	239	236.1	37.4	299	295.3	46.8
60	59.3	09.4	120	118.5	18.8	180	177.8	28.2	240	237.0	37.5	300	296.3	46.9
Diſt.	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.

for 81 Degrees.

Difference of Latitude and Departure for 10 Degrees.

Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.
1	01.0	00.2	61	60.1	10.6	121	119.2	21.0	181	178.2	31.4	241	237.3	41.8
2	02.0	00.3	62	61.1	10.8	122	120.1	21.2	182	179.2	31.6	242	238.3	42.0
3	03.0	00.5	63	62.0	10.9	123	121.1	21.3	183	180.2	31.7	243	239.3	42.1
4	03.9	00.7	64	63.0	11.1	124	122.1	21.5	184	181.2	31.9	244	240.3	42.3
5	04.9	00.9	65	64.0	11.2	125	123.1	21.7	185	182.2	32.1	245	241.3	42.5
6	05.9	01.0	66	65.0	11.4	122	124.1	21.8	186	183.2	32.3	246	242.3	42.7
7	06.9	01.2	67	66.0	11.6	127	125.1	22.0	187	184.2	32.4	247	243.2	42.8
8	07.9	01.4	68	67.0	11.8	128	126.1	22.2	188	185.1	32.6	248	244.2	43.0
9	08.9	01.6	69	68.0	12.0	129	127.0	22.4	189	186.1	32.8	249	245.2	43.2
10	09.8	01.7	70	68.9	12.1	130	128.0	22.5	190	187.1	32.9	250	246.2	43.4
11	10.8	01.9	71	69.9	12.3	131	129.0	22.7	191	188.1	33.1	251	247.2	43.5
12	11.8	02.1	72	70.9	12.5	132	130.0	22.9	192	189.1	33.3	252	248.2	43.7
13	12.8	02.3	73	71.9	12.7	133	131.0	23.1	193	190.1	33.5	253	249.2	43.9
14	13.8	02.4	74	72.9	12.8	134	132.0	23.2	194	191.0	33.6	254	250.1	44 0
15	14.8	02.6	75	73.9	13.0	135	132.9	23.4	195	192.0	33.8	255	251.1	44.2
16	15.8	02.8	76	74.8	13.2	136	133.9	23.6	196	193.0	34 0	256	252.1	44 4
17	16.7	02.9	77	75.8	13.4	137	134.9	23.8	197	194.0	34.2	257	253.1	44.6
18	17.7	03.1	78	76.8	13.5	138	135.9	23.9	198	195.0	34.3	258	254.1	44.7
19	18.7	03.3	79	77.8	13.7	139	136.9	24.1	199	196.0	34.5	259	255.1	44.9
20	19.7	03.5	80	78.8	13.9	140	137.9	24.3	100	197.0	34.7	260	256.0	45.1
21	20.7	03.6	81	79.8	14.0	141	138.9	24.4	101	197.9	34.9	261	257.0	45.3
22	21.7	03.8	82	80.8	14.2	142	139.8	24.6	102	198.9	35.0	262	258.0	45.4
23	22.7	04.0	83	81.7	14.4	143	140.8	24.8	103	199.9	35.2	263	259.0	45.6
24	23.6	04.2	84	82.7	14.6	144	141.8	25.0	104	200.9	35.4	264	360.0	45.8
25	24.6	04.3	85	83.7	14.7	145	142.8	25.1	105	201.9	35.5	265	261.0	46 0
26	25.6	04.5	86	84.7	14.9	146	143.8	25.3	106	202.9	35.7	266	262.0	46.1
27	26.6	04.7	87	85.7	15.1	147	144.8	25.5	107	203.9	35.9	267	262.9	46.3
28	27.6	04.9	88	86.7	15.3	148	145.7	25.7	108	204.9	36.1	268	263.9	46.5
29	28.6	05.0	89	87.6	15.4	149	146.7	25.8	109	205.8	36.2	269	264.9	46.6
30	29.5	05.2	90	88.6	15.6	150	147.7	26.0	110	206.8	36.4	270	265.9	46.8
31	30.5	05.4	91	89.6	15.8	151	148.7	26.2	211	207.8	36.6	271	266.9	47.0
32	31.5	05.5	92	90.6	16.0	152	149.7	26.4	212	208.8	36.8	272	267.9	47.2
33	32.5	05.7	93	91.6	16.1	153	150.7	26.5	213	209.8	36.9	273	268.9	47.3
34	33.5	05.9	94	92.6	16.3	154	151.7	26.7	214	210.7	37.1	274	269.8	47.5
35	34.5	06.1	95	93.6	16.5	155	152.6	26.9	215	211.7	37.3	275	270.8	47.7
36	35.5	06.2	96	94.5	16.6	156	153.6	27.1	216	212.7	37.5	276	271.8	47.9
37	36.4	06.4	97	95.5	16.8	157	154.6	27.2	217	213.7	37.6	277	272.8	48.0
38	37.4	06.6	98	96.5	17.0	158	155.6	27.4	218	214.7	37.8	278	273.8	48.2
39	38.4	06.8	99	97.5	17.2	159	156.6	27.6	219	215.7	38.0	279	274.8	48.4
40	39.4	06.9	100	98.5	17.3	160	157.6	27.7	220	216.7	38.1	280	275.7	48.6
41	40.4	07.1	101	99.5	17.5	161	158.6	27.9	221	217.6	38.3	281	276.7	48.7
42	41.4	07.3	102	100.4	17.7	162	159.5	28.1	222	218.6	38.5	282	277.7	48.9
43	42.3	07.5	103	101.4	17.9	163	160.5	28.3	223	219.6	38.7	283	278.7	49.1
44	43.3	07.6	104	102.4	18.0	164	161.5	28.4	224	220.6	38.8	284	279.7	49.2
45	44.3	07.8	105	103.4	18.2	165	162.5	28.6	225	221.6	39.0	285	280.7	49.4
46	45.3	08.0	106	104.4	18.4	166	163.5	28.8	226	222.6	39.2	286	281.6	49.6
47	46.3	08.1	107	105.4	18.6	167	164.5	29.0	227	223.5	39.4	287	282.6	49.8
48	47.3	08.3	108	106.4	18.7	168	165.4	29.1	228	224.5	39.5	288	283.6	49.9
49	48.3	08.5	109	107.3	18.9	169	166.4	29.3	229	225.5	39.7	289	284.6	50.1
50	49.2	08.7	110	108.3	19.1	170	167.4	29.5	230	226.5	39.9	290	285.6	50.3
51	50.2	08.8	111	109.3	19.2	171	168.4	29.7	231	227.5	40.1	291	286.6	50.5
52	51.2	09.0	112	110.3	19.4	172	169.4	29.8	232	228.5	40.2	292	287.6	50.6
53	52.2	09.2	113	111.3	19.6	173	170.4	30.0	233	229.5	40.4	293	288.5	50.8
54	53.2	09.4	114	112.3	19.8	174	171.4	30.2	234	230.4	40.6	294	289.5	51.0
55	54.2	09.5	115	113.3	19.9	175	172.3	30.3	235	231.4	40.7	295	290.5	51.2
56	55.1	09.7	116	114.2	20.1	176	173.3	30.5	236	232.4	40.9	296	291.5	51.3
57	56.1	09.9	117	115.2	20.3	177	174.3	30.7	237	233.4	41.1	297	292.5	51.5
58	57.1	00.1	118	116.2	20.5	178	175.3	30.9	238	234.4	41.3	298	293.5	51.7
59	58.1	00.2	119	117.2	20.6	179	176.3	31.0	239	235.4	41.4	299	294.5	51.8
60	59.1	00.4	120	118.2	20.8	180	177.3	31.2	240	236.3	41.6	300	295.4	52.0
Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.

for 80 Degrees.

Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.
1	01.0	00.2	61	60.2	09.5	121	119.5	18.9	181	178.8	28.3
2	02.0	00.3	62	61.2	09.7	122	120.5	19.1	182	179.8	28.5
3	03.0	00.5	63	62.2	09.9	123	121.5	19.2	183	180.7	38.6
4	04.0	00.6	64	63.2	10.0	124	122.5	19.4	184	181.7	28.8
5	04.9	00.8	65	64.2	10.2	125	123.5	19.6	185	182.7	28.9
6	05.9	00.9	66	65.2	10.3	126	124.5	19.7	186	183.7	29.1
7	06.9	01.1	67	66.2	10.5	127	125.4	19.9	187	184.7	29.2
8	07.9	01.3	68	67.2	10.6	128	126.4	20.0	188	185.7	29.4
9	08.9	01.4	69	68.2	10.8	129	127.4	20.2	189	186.7	29.6
10	09.9	01.6	70	69.1	10.9	130	128.4	20.3	190	187.7	29.7
11	10.9	01.7	71	70.1	11.1	131	129.4	20.5	191	188.7	29.9
12	11.9	01.9	72	71.1	11.3	132	130.4	20.6	192	189.6	30.0
13	12.9	02.0	73	72.1	11.4	133	131.4	20.8	193	190.6	30.2
14	13.8	02.2	74	73.1	11.6	134	132.4	21.0	194	191.6	30.3
15	14.8	02.3	75	74.1	11.7	135	133.3	21.1	195	192.6	30.5
16	15.8	02.5	76	75.1	11.9	136	134.3	21.3	196	193.6	30.7
17	16.8	02.7	77	76.1	12.0	137	135.3	21.4	197	194.6	30.8
18	17.8	02.8	78	77.0	12.2	148	136.3	21.6	198	195.6	31.0
19	18.8	03.0	79	78.0	12.4	139	137.3	21.7	199	196.6	31.1
20	19.8	03.1	80	79.0	12.5	140	138.3	21.9	200	197.5	31.3
21	20.7	03.3	81	80.0	12.7	141	139.3	22.1	201	198.5	31.4
22	21.7	03.4	82	81.0	12.8	142	140.3	22.2	202	199.5	31.6
23	22.7	03.6	83	82.0	13.0	143	141.2	22.4	203	200.5	31.7
24	23.7	03.8	84	83.0	13.1	144	142.2	22.5	204	201.5	31.9
25	24.7	03.9	85	84.0	13.3	145	143.2	22.7	205	202.5	32.1
26	25.7	04.1	86	84.9	13.5	146	144.2	22.8	206	203.5	32.2
27	26.7	04.2	87	85.9	13.6	147	145.2	23.0	207	204.5	32.4
28	27.7	04.4	88	86.9	13.8	148	146.2	23.1	208	205.4	32.5
29	28.6	04.5	89	87.9	13.9	149	147.2	23.3	209	206.4	32.7
30	29.6	04.7	90	88.9	14.1	150	148.2	23.5	210	207.4	32.8
31	30.6	04.8	91	89.9	14.2	151	149.1	23.6	211	208.4	33.0
32	31.6	05.0	92	90.9	14.4	152	150.1	23.8	212	209.4	33.2
33	32.6	05.2	93	91.9	14.5	153	151.1	23.9	213	210.4	33.3
34	33.6	05.3	94	92.8	14.7	154	152.1	24.1	214	211.4	33.5
35	34.6	05.5	95	93.8	14.9	155	153.1	24.2	215	212.4	33.6
36	35.6	05.6	96	94.8	15.0	156	154.1	24.4	216	213.3	33.8
37	36.5	05.8	97	95.8	15.2	157	155.1	24.6	217	214.3	33.9
38	37.5	05.9	98	96.8	15.3	158	156.1	24.7	218	215.3	34.1
39	38.5	06.1	99	97.8	15.5	159	157.0	24.9	219	216.3	34.3
40	39.5	06.3	100	98.8	15.6	160	158.0	25.0	220	217.3	34.4
41	40.5	06.4	101	99.8	15.8	161	159.0	25.2	221	218.3	34.6
42	41.5	06.6	102	100.7	16.0	162	160.0	25.3	222	219.3	34.7
43	42.5	06.7	103	101.7	16.1	163	161.0	25.5	223	220.3	34.9
44	43.5	06.9	104	102.7	16.3	164	162.0	25.6	224	221.2	35.0
45	44.4	07.0	105	103.7	16.4	165	163.0	25.8	225	222.2	35.2
46	45.4	07.2	106	104.7	16.6	166	164.0	26.0	226	223.2	35.3
47	46.4	07.4	107	105.7	16.7	167	164.9	26.1	227	224.2	35.5
48	47.4	07.5	108	106.7	16.9	168	165.9	26.3	228	225.2	35.7
49	48.4	07.7	109	107.7	17.0	169	166.9	26.4	229	226.2	35.8
50	49.4	07.8	110	108.6	17.2	170	167.9	26.6	230	227.2	36.0
51	50.4	08.0	111	109.6	17.4	171	168.9	26.7	231	228.2	36.1
52	51.4	08.1	112	110.6	17.5	172	169.9	26.9	232	229.1	36.3
53	52.3	08.3	113	111.6	17.7	173	170.9	27.1	233	230.1	36.4
54	53.3	08.4	114	112.6	17.8	174	171.9	27.2	234	231.1	36.6
55	54.3	08.6	115	113.6	18.0	175	172.8	27.4	235	232.1	36.8
56	55.3	08.8	116	114.6	18.1	176	173.8	27.5	236	233.1	36.9
57	56.3	08.9	117	115.6	18.3	177	174.8	27.7	237	234.1	37.1
58	57.3	09.1	118	116.5	18.5	178	175.8	27.8	238	235.1	37.2
59	58.3	09.2	119	117.5	18.6	179	176.8	28.0	239	236.1	37.4
60	59.3	09.4	120	118.5	18.8	180	177.8	28.2	240	237.0	37.5
Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.

for 12 Degrees.

				Lat.	Dep.	Dist	Lat.	Dep.
				177.0	37.6	241	235.7	50.1
				178.0	37.9	242	236.7	50.3
				179.0	38.1	243	237.7	50.5
				180.0	38.3	244	238.6	50.8
				180.9	38.5	245	239.6	51.0
				181.9	38.7	246	2 0.6	51.2
				182.9	38.9	247	241.6	51.4
				183.9	39.1	248	242.5	51.6
				184.8	39.3	249	243.5	51.8
				185.8	39.5	250	244.5	52.0
				186.8	39.7	251	245.5	52.2
				187.8	39.9	252	246.5	52.4
				188.8	40.1	253	247.4	52.6
				189.7	40.4	254	248.4	52.8
				190.7	40.6	255	249.4	53.2
				191.7	40.8	256	250.4	53.2
				192.7	41.0	257	251.3	53.5
				193.6	41.2	258	252.3	53.7
				194.6	41.4	259	253.3	53.9
				195.6	41.6	260	254.3	54.1
			01	196.6	41.8	261	255.3	54.3
			02	197.6	42.0	262	256.2	54.5
			03	198.5	42.2	263	257.2	54.7
			04	199.5	42.4	264	258.2	54.9
			05	200.5	42.6	265	259.2	55.1
			06	201.5	42.8	266	260.1	55.3
			07	202.4	43.1	267	261.1	55.5
			208	203.4	43.3	268	262.1	55.7
			209	204.4	43.5	269	263.1	56.0
			210	205.4	43.7	270	264.1	56.2
		1.4	211	206.4	43.9	271	265.0	56.4
		1.6	212	207.3	44.1	272	266.0	56.6
		1.8	213	208.3	44.3	273	267.0	56.8
		32.0	214	209.3	44.5	274	268.0	57.0
		32.2	215	210.3	44.7	275	269.0	57.2
		32.4	216	211.2	44.9	276	269.9	57.4
	5	32.7	217	212.2	45.1	277	270.9	57.6
	5	32.9	218	213.2	45.3	278	271.9	57.8
	5.5	33.1	219	214.2	45.6	279	272.9	58.0
	6.5	33.3	220	215.2	45.8	280	273.8	58.2
	157.5	33.5	221	216.1	46.0	281	274.8	58.4
	158.4	33.7	222	217.1	86.2	282	275.8	58.7
	159.4	33.9	223	218.1	46.4	283	276.8	58.9
	160.4	34.1	224	219.1	46.6	284	277.8	59.1
5	161.4	34.3	225	220.1	46.8	285	278.7	59.3
6	162.3	34.5	226	221.0	47.0	285	279.7	59.5
67	163.3	34.7	227	222.0	47.2	287	280.7	59.7
168	164.3	34.9	228	223.0	47.4	288	281.7	59.9
169	165.3	35.2	229	[illegible]	[illegible]		282.6	60.1
170	166.3	35.4	230	[illegible]	[illegible]		[illegible]	60.3
171	167.2	35.6	231	[illegible]	[illegible]		[illegible]	60.5
172	168.2	35.8	232	[illegible]	[illegible]		[illegible]	60.7
173	169.2	36.0	233	[illegible]	[illegible]		[illegible]	60.9
74	170.2	36.2	234	[illegible]	[illegible]		[illegible]	61.2
	171.2	36.1	235	[illegible]	[illegible]		[illegible]	61.4
6	172.1	36.6	236	[illegible]	[illegible]		[illegible]	[illegible]
	173.1	36.8	237	[illegible]	[illegible]		[illegible]	[illegible]
	174.1	37.0	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
	175.1	37.2	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
	176.0	37.4	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
	Dep.	Lat.	D					

Difference of Latitude and Departure for 11 Degrees.

Dift.	Lat.	Dep.	Dift	Lat.	Dep.	Dift	Lat.	Dep.	Dift	Lat.	Dep.	Dift	Lat.	Dep.
1	01.0	00.2	61	59.9	11.6	121	118.8	23.1	181	177.7	34.5	241	236.6	46.0
2	02.0	00.4	62	60.9	11.8	122	119.8	23.3	182	178.6	34.7	242	237.5	46.2
3	02.9	00.6	63	61.8	12.0	123	120.7	23.5	183	179.6	34.9	243	238.5	46.4
4	03.9	00.8	64	62.8	12.2	124	121.7	23.7	184	180.6	35.1	244	239.5	46.6
5	04.9	01.0	65	63.8	12.4	125	122.7	23.9	185	181.6	35.3	245	240.5	46.7
6	05.9	01.1	66	64.8	12.6	126	123.7	24.0	186	182.6	35.5	246	241.5	47.0
7	06.9	01.3	67	65.8	12.8	127	124.7	24.2	187	183.6	35.7	247	242.5	47.1
8	07.9	01.5	68	66.7	13.0	128	125.6	24.4	188	184.5	35.9	248	243.4	47.3
9	08.8	01.7	69	67.7	13.2	129	126.6	24.6	189	185.5	36.1	249	244.4	47.5
10	09.8	01.9	70	68.7	13.4	130	127.6	24.8	190	186.5	36.3	250	245.4	47.7
11	10.8	02.1	71	69.7	13.5	131	128.6	25.0	191	187.5	36.4	251	246.4	47.9
12	11.8	02.3	72	70.7	13.7	132	129.6	25.2	192	188.5	36.6	252	247.4	48.1
13	12.8	02.5	73	71.7	13.9	133	130.6	25.4	193	189.4	36.8	253	248.3	48.3
14	13.7	02.7	74	72.6	14.1	134	131.5	25.6	194	190.4	37.0	254	249.3	48.5
15	14.7	02.9	75	73.6	14.3	135	132.5	25.8	195	191.4	37.2	255	250.3	48.7
16	15.7	03.1	76	74.6	14.5	136	133.5	25.9	196	192.4	37.4	256	251.3	48.8
17	16.7	03.2	77	75.6	14.7	137	134.5	26.1	197	193.4	37.6	257	252.3	49.0
18	17.7	03.4	78	76.6	14.9	138	135.5	26.3	198	194.4	37.8	258	253.2	49.2
19	18.7	03.6	79	77.5	15.1	139	136.4	26.5	199	195.4	38.0	259	254.2	49.4
20	19.6	03.8	80	78.5	15.3	140	137.4	26.7	200	196.3	38.2	260	255.2	49.6
21	20.0	04.0	81	79.5	15.5	141	138.4	26.9	201	197.3	38.4	261	256.2	49.8
22	21.6	04.2	82	80.5	15.6	142	139.4	27.1	202	198.3	38.5	262	257.2	50.0
23	22.6	04.4	83	81.5	15.8	143	140.4	27.3	203	199.3	38.7	263	258.2	50.2
24	23.6	04.6	84	82.5	16.0	144	141.3	27.5	204	200.2	38.9	264	259.1	50.4
25	24.5	04.8	85	83.4	16.2	145	142.3	27.7	205	201.2	39.1	265	260.1	50.6
26	25.5	05.0	86	84.4	16.4	146	143.3	27.9	206	202.2	39.3	266	261.1	50.8
27	26.5	05.2	87	85.4	16.6	147	144.3	28.0	207	203.2	39.5	267	262.1	50.9
28	27.5	05.3	88	86.4	16.8	148	145.3	28.2	208	204.2	39.7	268	263.1	51.1
29	28.5	05.5	89	87.4	17.0	149	146.3	28.4	209	205.2	39.9	269	264.0	51.3
30	29.4	05.7	90	88.3	17.2	150	147.2	28.6	210	206.1	40.1	270	265.0	51.5
31	30.4	05.9	91	89.3	17.4	151	148.2	28.8	211	207.1	40.3	271	266.0	51.7
32	31.4	06.1	92	90.3	17.6	152	149.2	29.0	212	208.1	40.4	272	267.0	51.9
33	32.4	06.3	93	91.3	17.7	153	150.2	29.2	213	209.1	40.6	273	268.0	52.1
34	33.4	06.5	94	92.3	17.9	154	151.2	29.4	214	210.1	40.8	274	269.0	52.3
35	34.4	06.7	95	93.3	18.1	155	152.1	29.6	215	211.0	41.0	275	269.9	52.5
36	35.3	06.9	96	94.2	18.3	156	153.1	29.8	216	212.0	41.2	276	270.9	52.7
37	36.3	07.1	97	95.2	18.5	157	154.1	30.0	217	213.0	41.4	277	271.9	52.9
38	37.3	07.3	98	96.2	18.7	158	155.1	30.1	218	214.0	41.6	278	272.9	53.0
39	38.3	07.4	99	97.2	18.9	159	156.1	30.3	219	215.0	41.8	279	273.9	53.2
40	39.3	07.6	100	98.2	19.1	160	157.1	30.5	220	215.9	42.0	280	274.8	53.4
41	40.2	07.8	101	99.1	19.3	161	158.0	30.7	221	216.9	42.2	281	275.8	53.6
42	41.2	08.0	102	100.1	19.5	162	159.0	30.9	222	217.9	42.4	282	276.8	53.8
43	42.2	08.2	103	101.1	19.7	163	160.0	31.1	223	218.9	42.5	283	277.8	54.0
44	43.2	08.4	104	102.1	19.8	164	161.0	31.3	224	219.9	42.7	284	278.8	54.2
45	44.2	08.6	105	103.1	20.0	165	162.0	31.5	225	220.9	42.9	285	279.8	54.4
46	45.2	08.8	106	104.0	20.2	166	162.9	31.7	226	221.8	43.1	286	280.7	54.6
47	46.1	09.0	107	105.0	20.4	167	163.9	31.9	227	222.8	43.3	287	281.7	54.8
48	47.1	09.2	108	106.0	20.6	168	164.9	32.1	228	223.8	43.5	288	282.7	55.0
49	48.1	09.3	109	107.0	20.8	169	165.9	32.2	229	224.8	43.7	289	283.7	56.1
50	49.1	09.9	110	108.0	21.0	170	166.9	32.4	230	225.8	43.9	290	284.7	55.3
51	50.1	09.7	111	109.0	21.2	171	167.9	32.6	231	226.7	44.1	291	285.6	55.5
52	51.0	09.9	112	109.9	21.4	172	168.8	32.8	232	227.7	44.3	292	286.6	55.7
53	52.0	10.1	113	110.9	21.6	173	169.8	33.0	233	228.7	44.5	293	287.6	55.9
54	53.0	10.3	114	111.9	21.8	174	170.8	33.2	234	229.7	44.6	294	288.6	56.0
95	54.0	10.5	115	112.9	21.9	175	171.8	33.4	235	230.7	44.8	295	289.6	56.3
56	55.0	10.7	116	113.9	22.1	176	172.8	33.6	236	231.7	45.0	296	290.5	56.5
57	56.0	10.9	117	114.8	22.3	177	173.7	33.8	237	232.6	45.2	297	291.5	56.7
58	56.9	11.1	118	115.8	22.5	178	174.7	34.0	238	233.6	45.4	298	292.5	56.5
59	57.9	11.3	119	116.8	22.7	179	175.7	34.2	239	234.6	45.6	299	293.5	57.0
60	58.9	11.4	120	117.8	22.9	180	176.7	34.3	240	235.6	45.8	300	294.5	57.2
Dift.	Dep.	Lat.	Dift	Dep.	Lat.	Dift	Dep.	Lat.	Dift	Dep.	Lat.	Dift	Dep.	Lat.

for 79 Degrees.

Difference of Latitude and Departure for 12 Degrees.

Diſt.	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.
1	01.0	00.2	61	59.7	12.7	121	118.3	25.2	181	177.0	37.6	241	235.7	50.1
2	02.0	00.4	62	60.6	12.9	122	119.3	25.4	182	178.0	37.9	242	236.7	50.3
3	02.9	00.6	63	61.6	13.1	123	120.3	25.6	183	179.0	38.1	243	237.7	50.5
4	03.9	00.8	64	62.6	13.3	124	121.3	25.8	184	180.0	38.3	244	238.6	50.8
5	04.9	01 0	65	63.6	13.5	125	122.3	26.0	185	180.9	38.5	245	239.6	51.0
6	05.9	01.2	66	64.5	13.7	126	123.2	26.2	186	181.9	38.7	246	2 0.6	51.2
7	06.8	01.5	67	65.5	13.9	127	124.2	26.4	187	182.9	38.9	247	241.6	51.4
8	07.8	01.7	68	66.5	14.1	128	125.2	26.6	188	183.9	39.1	248	242.5	51.6
9	08.8	01.9	69	67.5	14.4	129	126.2	26.8	189	184.8	39.3	249	243.5	51.8
10	09.8	02.1	70	68.5	14.6	130	127.1	27.0	190	185.8	39.5	250	244.5	52.0
11	10.8	02.3	71	69.4	14.8	131	128.1	27.2	191	186.8	39.7	251	245.5	52.2
12	11.7	02.5	72	70.4	15.0	132	129.1	27.5	192	187.8	39.9	252	246.5	52.4
13	12.7	02.7	73	71.4	15.2	133	130.1	27.7	193	188.8	40.1	253	247.4	52.6
14	13.7	02.9	74	72.4	15.4	134	131.1	27.9	194	189.7	40.4	254	248.4	52.8
15	14.7	03.1	75	73.4	15.6	135	132.0	28.1	195	190.7	40.6	255	249.4	53.2
16	15.6	03.3	76	74.3	15.8	136	133.0	28.3	196	191 7	40.8	256	250.4	53.2
17	16.6	03.5	77	75.3	16.0	137	134.0	28.5	197	192.7	41.0	257	251.3	53.5
18	17.6	03.7	78	76.3	16.2	138	135.0	28.7	198	193.6	41.2	258	252.3	53.7
19	18.6	04.0	79	77.3	16.4	139	135.9	28.9	199	194.6	41.4	259	253.3	53.9
20	19.6	04.2	80	78.2	16.6	140	136.9	29.1	200	195.6	41.6	260	254.3	54.1
21	20.5	04.4	81	79.2	16.8	141	137.9	29.3	201	196.6	41.8	261	255.3	54.3
22	21.5	04.6	82	80.2	17.1	142	138.9	29.5	202	197.6	42.0	262	256.2	54.5
23	22.5	04.8	83	81.2	17.3	143	139.9	29.7	203	198.5	42.2	263	257.2	54.7
24	23.5	05.0	84	82.2	17.5	144	140.8	30.0	204	199.5	42.4	264	258.2	54.9
25	24.5	05.2	85	83.1	17.7	145	141.8	30.2	205	200.5	42.6	265	259.2	55.1
26	25.4	05.4	86	84.1	17.9	146	142.8	30.4	206	201.5	42.8	266	260.1	55.3
27	26.4	05 6	87	85.1	18.0	147	143.8	30.6	207	202.4	43.1	267	261.1	55.5
28	27.4	05.8	88	86.1	18.3	148	144.7	30.8	208	203.4	43.3	268	262.1	55.7
29	28.4	06.0	89	87.0	18.5	149	145.7	31.0	209	204.4	43.5	269	263.1	56.0
30	29.3	06.2	90	88.0	18.7	150	146.7	31.2	210	205.4	43.7	270	264.1	56 2
31	30.3	06.4	91	89,0	18.9	151	147.7	31.4	211	206.4	43.9	271	265.0	56.4
32	31.3	06.7	92	90.0	19.1	152	148.7	31.6	212	207.3	44.1	272	266.0	56.6
33	32.3	06.9	93	91.0	19.3	153	149.6	31.8	213	208.3	44.3	273	267.0	56.8
34	33.3	07.1	94	91.9	19.6	154	150.6	32.0	214	209.3	44.5	274	268.0	57.0
35	34.2	07.3	95	92.9	19.8	155	151.6	32.2	215	210.3	44.7	275	269.0	57.2
36	35.2	07.5	96	93.9	20.0	156	152.6	32.4	216	211.2	44 9	276	269.9	57.4
37	36.2	07.7	97	94.9	20.2	157	153.5	32.7	217	212.2	45.1	277	270.9	57.6
38	37.2	07 9	98	95.8	20.4	158	154.5	32.9	218	213.2	45.3	278	271.9	57.8
39	38.1	08.1	99	96.8	20.6	159	155.5	33.1	219	214.2	45.6	279	272.9	58.0
40	39.1	08.3	100	97.8	20.8	160	156.5	33.3	220	215.2	45.8	280	273.8	58.2
41	40.1	08.5	101	98 8	21.0	161	157.5	33.5	221	216.1	46.0	281	274.8	58.4
42	41.1	08 7	102	99.8	21.2	162	158.4	33.7	222	217.1	86.2	282	275.8	58.7
43	42.1	08,9	103	100 7	21.4	163	159.4	33.9	223	218.1	46.4	283	276.8	58.9
44	43.0	09.2	104	101.7	21.6	164	160.4	34.1	224	219.1	46.6	284	277.8	59.1
45	44.0	09.4	105	102.7	21.8	165	161.4	34.3	225	220.1	46.8	285	278.7	59.3
46	45.0	09.6	106	103.7	22.0	166	162.3	34.5	226	221.0	47.0	285	279.7	59.5
47	46.0	09,8	107	104.6	22.3	167	163.3	34.7	227	222.0	47.2	287	280.7	59.7
48	46.9	10.0	108	105.6	22.5	168	164.3	34.9	228	223.0	47.4	288	281.7	59.9
49	47.9	10.2	109	106.6	22.7	169	165.3	35.2	229	224.0	47.6	289	282.6	60.1
50	48.9	10 4	110	107.6	22.9	170	166.3	35.4	230	224.9	47.8	290	283.6	60.3
51	49.9	10.6	111	108.6	23.1	171	167.2	35.6	231	225.9	48.0	291	284.6	60.5
52	50.9	10.8	112	109.5	23.3	172	168.2	35.8	232	226.9	48.3	292	285.6	60 7
53	51.8	11.0	113	110.5	23.5	173	169.2	36.0	233	227.9	48.5	293	286.6	60.9
54	52.8	11.2	114	111.5	23.7	174	170.2	36.2	234	228.9	48.7	294	287.5	61.2
55	53.8	11.4	115	112.5	23.9	175	171.2	36.1	235	229.8	48.9	295	288.5	61.4
56	54.8	11.6	116	113.4	24.1	176	172.1	36.6	236	230.8	49.1	296	289.5	61.6
57	55.7	11.9	117	114.4	24.3	177	173.1	36.8	237	231.8	49.3	297	290.5	61.8
58	56.7	12.1	118	115.4	24.5	178	174.1	37.0	238	232.8	49.5	298	291.4	62.0
59	57.7	12.3	119	116.4	24.8	179	175,1	37.2	239	233.7	49.7	299	292.4	62.2
60	58.7	12.5	120	117.4	25.0	180	176.0	37.4	240	234.7	49.9	300	293.4	62.4
Diſt.	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.

for 78 Degrees.

Difference of Latitude and Departure for 13 Degrees.

Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.
1	01.0	00.2	61	59.4	13.7	121	117.9	27.2	181	176.4	40.7	241	234.8	54.2
2	01.9	00.4	62	60.4	13.9	122	118.9	27.4	182	177.3	40.9	242	235.8	54.4
3	02.9	00.7	63	61.4	14.2	123	119.8	27.7	183	178.3	41.2	243	236.8	54.7
4	03.9	00.9	64	62.4	14.4	124	120.8	27.9	184	179.3	41.4	244	237.8	54.9
5	04.9	01.1	65	63.3	14.6	125	121.8	28.1	185	180.3	41.6	245	238.7	55.1
6	05.8	01.3	66	64.3	14.8	126	122.8	28.3	186	181.2	41.8	246	239.7	55.3
7	06.8	01.6	67	65.3	15.1	127	123.7	28.6	187	182.2	42.1	247	240.7	55.6
8	07.8	01.8	68	66.3	15.3	128	124.7	28.8	188	183.2	42.3	248	241.6	55.8
9	08.8	02.0	69	67.2	15.5	129	125.7	29.0	189	184.2	42.5	249	242.6	56.0
10	09.7	02.2	70	68.2	15.7	130	126.7	29.2	190	185.1	42.7	250	243.6	56.2
11	10.7	02.5	71	69.2	16.0	131	127.6	29.5	191	186.1	43.0	251	244.6	56.5
12	11.7	02.7	72	70.2	16.2	132	128.6	29.7	192	187.1	43.2	252	245.5	56.7
13	12.7	02.9	73	71.1	16.4	133	129.6	29.9	193	188.1	43.4	253	246.5	56.9
14	13.6	03.1	74	72.1	16.6	134	130.6	30.1	194	189.0	43.6	254	247.5	57.1
15	14.6	03.4	75	73.1	16.9	135	131.5	30.4	195	190.0	43.9	255	248.5	57.4
16	15.6	03.6	76	74.1	17.1	136	132.5	30.6	196	191.0	44.1	256	249.4	57.6
17	16.6	03.8	77	75.0	17.3	137	133.5	30.8	197	192.0	44.3	257	250.4	57.8
18	17.5	04.0	78	76.0	17.5	138	134.5	31.0	198	192.9	44.5	258	251.4	58.0
19	18.5	04.3	79	77.0	17.8	139	135.4	31.3	199	193.9	44.8	259	252.4	58.3
20	19.5	04.5	80	78.0	18.0	140	136.4	31.5	200	194.9	45.0	260	253.3	58.5
21	20.5	04.7	81	78.9	18.2	141	137.4	31.7	201	195.9	45.2	261	254.3	58.7
22	21.4	04.9	82	79.9	18.4	142	138.4	31.9	202	196.8	45.4	262	255.3	58.9
23	22.4	05.2	83	80.9	18.7	143	139.3	32.2	203	197.8	45.7	263	256.3	59.2
24	23.4	05.4	84	81.8	18.9	144	140.3	32.4	204	198.8	45.9	264	257.2	59.4
25	24.4	05.6	85	82.8	19.1	145	141.3	32.6	205	199.7	46.1	265	258.2	59.6
26	25.3	05.8	86	83.8	19.3	146	142.3	32.8	206	200.7	46.3	266	259.2	59.8
27	26.3	06.1	87	84.8	19.6	147	143.2	33.1	207	201.7	46.6	267	260.2	60.1
28	27.3	06.3	88	85.7	19.8	148	144.2	33.3	208	202.7	46.8	268	261.1	60.3
29	28.3	06.5	89	86.7	20.0	149	145.2	33.5	209	203.6	47.0	269	262.1	60.5
30	29.2	06.7	90	87.7	20.2	150	146.2	33.7	210	204.6	47.2	270	263.1	60.7
31	30.2	07.0	91	88.7	20.5	151	147.1	34.0	211	205.6	47.5	271	264.1	61.0
32	31.2	07.2	92	89.6	20.7	152	148.1	34.2	212	206.6	47.7	272	265.0	61.2
33	32.2	07.4	93	90.6	20.9	153	149.1	34.4	213	207.5	47.9	273	266.0	61.4
34	33.1	07.6	94	91.6	21.1	154	150.1	34.6	214	208.5	48.1	274	267.0	61.6
35	34.1	07.9	95	92.6	21.4	155	151.0	34.9	215	209.5	48.4	275	268.0	61.9
36	35.1	08.1	96	93.5	21.6	156	152.0	35.1	216	210.5	48.6	276	268.9	62.1
37	36.1	08.3	97	94.5	21.8	157	153.0	35.3	217	211.4	48.8	277	269.9	62.3
38	37.0	08.5	98	95.5	22.0	158	154.0	35.5	218	212.4	49.0	278	270.9	62.5
39	38.0	08.8	99	96.5	22.3	159	154.9	35.8	219	213.4	49.3	279	271.9	62.8
40	39.0	08.0	100	97.4	22.5	160	155.9	35.0	220	214.4	49.5	280	272.8	63.0
41	39.9	09.2	101	98.4	22.7	161	156.9	36.2	221	215.3	49.7	281	273.8	63.2
42	40.9	09.4	102	99.4	22.9	162	157.9	36.4	222	216.3	49.9	282	274.8	63.4
43	41.9	09.7	103	100.4	23.2	163	158.8	36.7	223	217.3	50.2	283	275.8	63.7
44	42.9	09.9	104	101.3	23.4	164	159.8	36.9	224	218.3	50.4	284	276.7	63.9
45	43.8	10.1	105	102.3	23.6	165	160.8	37.1	225	219.2	50.6	285	277.7	64.1
46	44.8	10.3	106	103.3	23.8	166	161.7	37.3	226	220.2	50.8	286	278.7	64.3
47	45.8	10.6	107	104.3	24.1	167	162.7	37.6	127	221.2	51.1	287	279.6	64.6
48	46.8	10.8	108	105.2	24.3	168	163.7	37.8	228	222.2	51.3	288	280.6	64.8
49	47.7	11.0	109	106.2	24.5	169	164.7	38.0	229	223.1	51.5	289	281.6	65.0
50	48.7	11.2	110	107.2	24.7	170	165.6	38.2	230	224.1	51.7	290	282.9	65.2
51	49.7	11.5	111	108.2	25.0	171	166.6	38.5	231	225.1	52.0	291	283.5	65.5
52	50.7	11.7	112	109.1	25.2	172	167.6	38.7	232	226.1	52.2	292	284.5	65.7
53	51.6	11.9	113	110.1	25.4	173	168.6	38.9	233	227.0	52.4	293	285.5	65.9
54	52.6	12.1	114	111.1	25.6	174	169.5	39.1	234	228.0	52.6	294	286.5	66.1
55	53.6	12.4	115	112.1	25.9	175	170.5	39.4	235	229.0	52.9	295	287.4	66.4
56	54.6	12.6	116	113.0	26.1	176	171.5	39.6	236	230.0	53.1	296	288.4	66.6
57	55.5	12.8	117	114.0	26.3	177	172.5	39.8	237	230.9	53.3	297	289.4	66.8
58	56.5	13.0	118	115.0	26.5	178	173.4	40.0	238	231.9	53.5	298	290.4	67.0
59	57.5	13.3	119	116.0	26.8	179	174.4	40.3	239	232.9	53.8	299	291.3	67.3
60	58.5	13.5	120	116.9	27.0	180	175.4	40.5	240	233.9	54.0	300	292.3	67.5
Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.

for 77 Degrees.

Difference of Latitude and Departure for 14 Degrees.

Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.
1	01.0	00.2	61	59.2	14.8	121	117.4	29.3	181	175.6	43.8	241	233.8	58.3
2	01.9	00.5	62	60.2	15.0	122	118.4	29.5	182	176.6	44.0	242	234.8	58.6
3	02.9	00.7	63	61.1	15.2	123	119.3	29.8	183	177.6	44.3	243	235.8	58.8
4	03.9	01.0	64	62.1	15.5	124	120.3	30.0	184	178.5	44.5	244	236.7	59.0
5	04.9	01.2	65	63.1	15.7	125	121.3	30.2	185	179.5	44.8	245	237.7	59.3
6	05.8	01.5	66	64.0	16.0	122	122.3	30.5	186	180.5	45.0	246	238.7	59.5
7	06.8	01.7	67	65.0	16.2	127	123.2	30.7	187	181.4	45.3	247	239.7	59.8
8	07.8	01.9	68	66.0	16.5	128	124.2	31.0	188	182.4	45.5	248	240.6	60.0
9	08.7	02.2	69	66.9	16.7	129	125.2	31.2	189	183.4	45.7	249	241.6	60.3
10	09.7	02.4	70	67.9	16.9	130	126.1	31.5	190	184.4	46.0	250	242.6	60.5
11	10.7	02.7	71	68.9	17.2	131	127.1	31.7	191	185.3	46.2	251	243.5	60.7
12	11.6	02.9	72	69.9	17.4	132	128.1	31.9	192	186.3	46.5	252	244.5	61.0
13	12.6	03.1	73	70.8	17.7	133	129.0	32.2	193	187.3	46.7	253	245.5	61.2
14	13.6	03.4	74	71.8	17.9	134	130.0	32.4	194	188.2	46.9	254	246.4	61.5
15	14.6	03.6	75	72.8	18.1	135	131.0	32.7	195	189.2	47.2	255	247.4	61.7
16	15.5	03.9	76	73.7	18.4	136	132.0	32.9	196	190.2	47.4	256	248.4	62.0
17	16.5	04.1	77	74.7	18.6	137	132.9	33.2	197	191.1	47.7	257	249.4	62.2
18	17.5	04.4	78	75.7	18.9	138	133.9	33.4	198	192.1	47.9	258	250.3	62.4
19	18.4	04.6	79	76.7	19.1	139	134.9	33.6	199	193.1	48.2	259	251.3	62.7
20	19.4	04.8	80	77.6	19.4	140	135.9	33.9	100	194.1	48.4	260	252.3	62.9
21	20.4	05.1	81	78.6	19.6	141	136.8	34.1	101	195.0	48.6	261	253.2	63.2
22	21.3	05.3	82	79.6	19.8	142	137.8	34.4	102	196.0	48.9	262	254.2	63.4
23	22.3	05.6	83	80.5	20.1	143	138.7	34.6	103	197.0	49.1	263	255.2	63.6
24	23.3	05.8	84	81.5	20.3	144	139.7	34.8	104	197.9	49.4	264	256.2	63.9
25	24.3	06.0	85	82.5	20.6	145	140.7	35.1	105	198.9	49.6	265	257.1	64.1
26	25.2	06.3	86	83.4	20.8	146	141.7	35.3	106	199.9	49.9	266	258.1	64.4
27	26.2	06.5	87	84.4	21.1	147	142.6	35.6	107	200.8	50.1	267	259.1	64.6
28	27.2	06.8	88	85.4	21.3	148	143.6	35.8	108	201.8	50.3	268	260.0	64.9
29	28.1	07.0	89	86.4	21.5	149	144.6	36.1	109	202.8	50.6	269	261.0	65.1
30	29.1	07.3	90	87.3	21.8	150	145.5	36.3	110	203.8	50.8	270	262.0	65.3
31	30.1	07.5	91	88.3	22.0	151	146.5	36.5	211	204.7	51.1	271	262.9	65.6
32	31.0	07.7	92	89.3	22.3	152	147.5	36.8	212	205.7	51.3	272	263.9	65.8
33	32.0	08.0	93	90.2	22.5	153	148.5	37.0	213	206.7	51.5	273	264.9	66.1
34	33.0	08.2	94	91.2	22.7	154	149.4	37.3	214	207.6	51.8	274	265.9	66.3
35	34.0	08.5	95	92.2	23.0	155	150.4	37.5	215	208.6	52.0	275	266.8	66.5
36	34.9	08.7	96	93.1	23.2	156	151.4	37.7	216	209.6	52.3	276	267.8	66.8
37	35.9	09.0	97	94.1	23.5	157	152.3	38.0	217	210.5	52.5	277	268.8	67.0
38	36.9	09.2	98	95.1	23.7	158	153.3	38.2	218	211.5	52.8	278	269.7	67.3
39	37.8	09.4	99	96.1	24.0	159	154.3	38.5	219	212.5	53.0	279	270.7	67.5
40	38.8	09.7	100	97.0	24.2	160	155.2	38.7	220	213.5	53.2	280	271.7	67.8
41	39.8	09.9	101	98.0	24.4	161	156.2	39.0	221	214.4	53.5	281	272.6	68.0
42	40.8	10.2	102	99.0	24.7	162	157.2	39.2	222	215.4	53.7	282	273.6	68.2
43	41.7	10.4	103	99.9	24.9	163	158.2	39.4	223	216.4	54.0	283	274.6	68.5
44	42.7	10.6	104	100.9	25.2	164	159.1	39.7	224	217.3	54.2	284	275.6	68.7
45	43.7	10.9	105	101.9	25.4	165	160.1	39.9	225	218.3	54.4	285	276.5	69.0
46	44.6	11.1	106	102.8	25.7	166	161.1	40.2	226	219.3	54.7	286	277.5	69.2
47	45.6	11.4	107	103.8	25.9	167	162.0	40.4	227	220.3	54.9	287	278.5	69.5
48	46.6	11.6	108	104.8	26.1	168	163.0	40.7	228	221.2	55.2	288	279.4	69.7
49	47.5	11.9	199	105.8	26.4	169	164.0	40.9	229	222.2	55.4	289	280.4	69.9
50	48.5	12.1	110	106.7	26.6	170	164.9	41.1	230	223.2	55.7	290	281.4	70.2
51	49.5	12.3	111	107.7	26.9	171	165.9	41.4	231	224.1	55.9	291	282.3	70.4
52	50.5	12.6	112	108.7	27.1	172	166.9	41.6	232	225.1	56.1	292	283.3	70.7
53	51.4	12.8	113	109.6	27.3	173	167.9	41.9	233	226.1	56.4	293	284.3	70.9
54	52.4	13.1	114	110.6	27.6	174	168.8	42.1	234	227.0	56.6	294	285.3	71.1
55	53.4	13.3	115	111.6	27.8	175	169.8	42.3	235	228.0	56.9	295	286.2	71.4
56	54.3	13.6	116	112.6	28.1	176	170.8	42.7	236	229.0	57.1	296	287.2	71.6
57	55.3	13.8	117	113.5	28.3	177	171.7	42.8	237	230.0	57.4	297	288.2	71.9
58	56.3	14.0	118	114.5	28.6	178	172.7	43.1	238	230.9	57.6	298	289.1	72.1
59	57.2	14.3	119	115.5	28.8	179	173.7	43.3	239	231.9	57.8	299	290.1	72.4
60	58.2	14.5	120	116.4	29.0	180	174.6	43.6	240	232.9	58.1	300	291.1	72.6
Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.

for 76 Degrees.

Difference of Latitude and Departure for 15 Degrees.

Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.
1	01.0	00.3	61	58.9	15.8	121	116.9	31.3	181	174.8	46.8	241	232.8	62.4
2	01.9	00.5	62	59.9	16.0	122	117.8	31.6	182	175.8	47.1	242	233.7	62.6
3	02.9	00.8	63	60.9	16.3	123	118.8	31.8	183	176.8	47.4	243	234.7	62.9
4	03.9	01.0	64	61.8	16.6	124	119.8	32.1	184	177.7	47.6	244	235.7	63.1
5	04.8	01.3	65	62.8	16.8	125	120.7	32.4	185	178.7	47.9	245	236.6	63.4
6	05.8	01.6	66	63.7	17.1	126	121.7	32.6	186	179.7	48.1	246	237.6	63.7
7	06.8	01.8	67	64.7	17.3	127	122.7	32.9	187	180.6	48.4	247	238.6	63.9
8	07.7	02.1	68	65.7	17.6	128	123.6	33.1	188	181.6	48.7	248	239.5	64.2
9	08.7	02.3	69	66.6	17.9	129	124.6	33.4	189	182.6	48.9	249	240.5	64.4
10	09.7	02.6	70	67.6	18.1	130	125.6	33.6	190	183.5	49.2	250	241.5	64.7
11	10.6	02.8	71	68.6	18.4	131	126.5	33.9	191	184.5	49.4	251	242.4	65.0
12	11.6	03.1	72	69.5	18.6	132	127.5	34.2	192	185.5	49.7	252	243.4	65.2
13	12.6	03.4	73	70.5	18.9	133	128.5	34.4	193	186.4	49.9	253	244.4	65.5
14	13.5	03.6	74	71.5	19.2	134	129.4	34.7	194	187.4	50.2	254	245.3	65.7
15	14.5	03.9	75	72.4	19.4	135	130.4	34.9	195	188.4	50.5	255	246.3	66.0
16	15.5	04.1	76	73.4	19.7	136	131.4	35.2	196	189.3	50.7	256	247.3	66.3
17	16.4	04.4	77	74.4	19.9	137	132.3	35.5	197	190.3	51.0	257	248.2	66.5
18	17.4	04.7	78	75.3	20.2	148	133.3	35.7	198	191.2	51.2	258	249.2	66.8
19	18.4	04.9	79	76.3	20.4	139	134.3	36.0	199	192.2	51.5	259	250.2	67.0
20	19.3	05.2	80	77.3	20.7	140	135.2	36.2	200	193.2	51.8	260	251.1	67.3
21	20.3	05.4	81	78.2	21.0	141	136.2	36.5	201	194.1	52.0	261	252.1	67.5
22	21.2	05.7	82	79.2	21.2	142	137.2	36.7	202	195.1	52.3	262	253.1	67.8
23	22.2	06.0	83	80.2	21.5	143	138.1	37.0	203	196.1	52.5	263	254.0	68.1
24	23.2	06.2	84	81.1	21.7	144	139.1	37.3	204	197.0	52.8	264	255.0	68.3
25	24.1	06.5	85	82.1	22.0	145	140.1	37.5	205	198.0	53.1	265	256.0	68.6
26	25.1	06.7	86	83.1	22.3	146	141.0	37.8	206	199.0	53.3	266	256.9	68.8
27	26.1	07.0	87	84.0	22.5	147	142.0	38.0	207	199.9	53.6	267	257.9	69.1
28	27.0	07.2	88	85.0	22.8	148	143.0	38.3	208	200.9	53.8	268	258.9	69.4
29	28.0	07.5	89	86.0	23.0	149	143.0	38.6	209	201.9	54.1	269	259.8	69.6
30	29.0	07.8	90	86.9	23.3	150	144.9	38.8	210	202.8	54.3	270	260.8	69.9
31	29.9	08.0	91	87.9	23.6	151	145.8	39.1	211	203.8	54.6	271	261.8	70.1
32	30.9	08.3	92	88.9	23.8	152	136.8	39.3	212	204.8	54.9	272	262.7	70.4
33	31.9	08.5	93	89.8	24.1	153	147.8	39.6	213	205.7	55.1	273	263.7	70.7
34	32.8	08.8	94	90.8	24.3	154	148.7	39.9	214	206.7	55.4	274	264.7	70.9
35	33.8	09.1	95	91.8	24.6	155	149.7	40.1	215	207.7	55.6	275	265.6	71.2
36	34.8	09.3	96	92.7	24.8	156	150.7	40.4	216	208.7	55.9	276	266.6	71.4
37	35.7	09.6	97	93.7	25.1	157	151.6	40.6	217	209.6	56.1	277	267.6	71.7
38	36.7	09.8	98	94.7	25.4	158	152.6	40.9	218	210.6	56.4	278	268.5	71.9
39	37.7	10.1	99	95.6	25.6	159	153.6	41.1	219	211.5	56.7	279	269.5	72.2
40	38.6	10.4	100	96.6	25.9	160	154.5	41.4	220	212.5	56.9	280	270.5	72.5
41	39.6	10.6	101	97.6	26.1	161	155.5	41.7	221	213.5	57.2	281	271.4	72.7
42	40.6	10.9	102	98.5	26.4	162	156.5	41.9	222	214.4	57.5	282	272.4	73.0
43	41.5	11.1	103	99.5	26.7	163	157.4	42.2	223	215.4	57.7	283	273.4	73.2
44	42.5	11.4	104	100.5	26.9	164	158.4	42.4	224	216.4	58.0	284	274.3	73.5
45	43.5	11.6	105	101.4	27.2	165	159.4	42.7	225	217.3	58.2	285	275.3	73.8
46	44.4	11.9	106	102.4	27.4	166	160.3	43.0	226	218.3	58.5	286	276.2	74.0
47	45.4	12.2	107	103.4	27.7	167	161.3	43.2	227	219.3	58.7	287	277.2	74.3
48	46.4	12.4	108	104.3	28.0	168	162.3	43.5	228	220.2	59.0	288	278.2	74.5
49	47.3	12.7	109	105.3	28.2	169	163.2	43.7	229	221.2	59.3	289	279.1	74.8
50	48.3	12.9	110	106.2	28.5	170	164.2	44.0	230	222.2	59.5	290	280.1	75.0
51	49.3	13.2	111	107.2	28.7	171	165.2	44.3	231	223.1	59.8	291	281.1	75.3
52	50.2	13.5	112	108.2	29.0	172	166.1	44.5	232	224.1	60.0	292	282.0	75.6
53	51.2	13.7	113	109.1	29.2	173	167.1	44.8	233	225.1	60.3	293	283.0	75.8
54	52.2	14.0	114	110.1	29.5	174	168.1	45.0	234	226.0	60.6	294	284.0	76.1
55	53.1	14.2	115	111.1	29.8	175	169.0	45.3	235	227.0	60.8	295	284.9	76.3
56	54.1	14.5	116	112.0	30.0	176	170.0	45.5	236	228.0	61.1	296	285.9	76.6
57	55.1	14.8	117	113.0	30.3	177	171.0	45.8	237	228.9	61.3	297	286.9	76.9
58	56.0	15.0	118	114.0	30.5	178	171.9	46.1	238	229.9	61.6	298	287.8	77.1
59	57.0	15.3	119	114.9	30.8	179	172.9	46.3	239	230.9	61.9	299	288.8	77.4
60	58.0	15.5	120	115.9	30.1	180	173.9	46.6	240	231.8	62.1	300	289.8	77.6
Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.

for 75 Degrees.

Difference of Latitude and Departure for 16 Degrees.

Diſt.	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.
1	01.0	00.3	61	58.6	16.8	121	116.3	33.3	181	174.0	49.9	241	231.6	66.4
2	01.9	00.6	62	59.6	17.1	122	117.3	33.6	182	174.9	50.2	242	232.6	66.7
3	02.9	00.8	63	60.6	17.4	123	118.2	33.9	183	175.9	50.4	243	233.6	67.0
4	03.8	01.1	64	61.5	17.6	124	119.2	34.2	184	176.8	50.7	244	234.5	67.2
5	04.8	01.4	65	62.5	17.9	125	120.1	34.4	185	177.8	51.0	245	235.5	67.5
6	05.8	01.7	66	63.4	18.2	126	121.1	34.7	186	178.8	51.3	246	236.4	67.8
7	06.7	01.9	67	64.4	18.5	127	122.1	35.0	187	179.7	51.5	247	237.4	68.1
8	07.7	02.2	68	65.4	18.7	128	123.0	35.3	188	180.7	51.8	248	238.4	68.3
9	08.7	02.5	69	66.3	19.0	129	124.0	35.6	189	181.7	52.1	249	239.3	68.6
10	09.6	02.8	70	67.3	19.3	130	124.9	35.8	190	182.6	52.4	250	240.3	68.9
11	10.6	03.0	71	68.2	19.6	131	125.9	36.1	191	183.6	52.6	251	241.2	69.2
12	11.5	03.3	72	69.2	19.8	132	126.9	36.4	192	184.5	52.9	252	242.2	69.5
13	12.5	03.6	73	70.2	20.1	133	127.8	36.7	193	185.5	53.2	253	243.2	69.7
14	13.5	03.9	74	71.1	20.4	134	128.8	36.9	194	186.5	53.5	254	244.1	70.0
15	14.4	04.1	75	72.1	20.7	135	129.8	37.2	195	187.4	53.7	255	245.1	70.3
16	15.4	04.4	76	73.0	20.9	136	130.7	37.5	196	188.4	54.0	256	246.0	70.6
17	16.3	04.7	77	74.0	21.2	137	131.7	37.8	197	189.3	54.3	257	247.0	70.8
18	17.3	05.0	78	75.0	21.5	138	132.6	38.0	198	190.3	54.6	258	248.0	71.1
19	18.3	05.2	79	75.9	21.8	139	133.6	38.3	199	191.3	54.8	259	248.9	71.4
20	19.2	05.5	80	76.9	22.0	140	134.6	38.6	200	192.2	55.1	260	249.9	71.7
21	20.2	05.8	81	77.9	22.3	141	135.5	38.9	201	193.2	55.4	261	250.9	71.9
22	21.1	06.1	82	78.8	22.6	142	136.5	39.1	202	194.1	55.7	262	251.8	72.2
23	22.1	06.3	83	79.8	22.9	143	137.4	39.4	203	195.1	55.9	263	252.8	72.5
24	23.1	06.6	84	80.7	23.1	144	138.4	39.7	204	196.1	56.2	264	253.7	72.8
25	24.0	06.9	85	81.7	23.4	145	139.4	40.0	205	197.0	56.5	265	254.7	73.0
26	25.0	07.2	86	82.7	23.7	146	140.3	40.2	206	198.0	56.8	266	255.7	73.3
27	26.0	07.4	87	83.6	24.0	147	141.3	40.5	207	199.0	57.0	267	256.6	73.6
28	26.9	07.7	88	84.6	24.3	148	142.2	40.8	208	199.9	57.3	268	257.6	73.9
29	27.9	08.0	89	85.5	24.5	149	143.2	41.1	209	200.9	57.6	269	258.5	74.1
30	28.8	08.3	90	86.5	24.8	150	144.2	41.3	210	201.8	57.9	270	259.5	74.4
31	29.8	08.5	91	87.5	25.1	151	145.1	41.6	211	202.8	58.2	271	260.5	74.7
32	30.8	08.8	92	88.4	25.4	152	146.1	41.9	212	203.8	58.4	272	261.4	75.0
33	31.7	09.1	93	89.4	25.6	153	147.1	42.2	213	204.7	58.7	273	262.4	75.2
34	32.7	09.4	94	90.3	25.9	154	148.0	42.4	214	205.7	59.0	274	263.3	75.5
35	33.6	09.6	95	91.3	26.2	155	149.0	42.7	215	206.6	59.3	275	264.3	75.8
36	34.6	09.9	96	92.3	26.5	156	149.9	43.0	216	207.6	59.5	276	265.3	76.1
37	35.6	10.2	97	93.2	26.7	157	150.9	43.3	217	208.6	59.8	277	266.2	76.3
38	36.5	10.5	98	94.2	27.0	158	151.9	43.5	218	209.5	60.1	278	267.2	76.6
39	37.5	10.7	99	95.2	27.3	159	152.8	43.8	219	210.5	60.4	279	268.2	76.9
40	38.4	11.0	100	96.1	27.6	160	153.8	44.1	220	211.4	60.6	280	269.1	77.2
41	39.4	11.3	101	97.1	27.8	161	154.7	44.4	221	212.4	60.9	281	270.1	77.4
42	40.4	11.6	102	98.0	28.1	162	155.7	44.6	222	213.4	61.2	282	271.0	77.7
43	41.3	11.9	103	99.0	28.4	163	156.7	44.9	223	214.3	61.5	283	272.0	78.0
44	42.3	12.1	104	100.0	28.7	164	157.6	45.2	224	215.3	61.7	284	273.0	78.3
45	43.3	12.4	105	100.9	28.9	165	158.6	45.5	225	216.3	62.0	285	273.9	78.5
46	44.2	12.7	106	101.9	29.2	166	159.5	45.7	226	217.2	62.3	286	274.9	78.8
47	45.2	13.0	107	102.8	29.5	167	160.5	46.0	227	218.2	62.6	287	275.8	79.1
48	46.1	13.2	108	103.8	29.8	168	161.5	46.3	228	219.1	62.8	288	276.8	79.4
49	47.1	13.5	109	104.8	30.0	169	162.4	46.6	229	220.1	63.1	289	277.8	79.6
50	48.1	13.8	110	105.7	30.3	170	163.4	46.9	230	221.1	63.4	290	278.7	79.9
51	49.0	14.1	111	106.7	30.6	171	164.4	47.1	231	222.0	63.7	291	279.7	80.2
52	50.0	14.3	112	107.6	30.9	172	165.3	47.4	232	223.0	63.9	292	280.6	80.5
53	50.9	14.6	113	108.6	31.1	173	166.3	47.7	233	223.9	64.2	293	281.6	80.8
54	51.9	14.9	114	109.6	31.4	174	167.2	48.0	234	224.9	64.5	294	282.6	81.0
55	52.9	15.2	115	110.5	31.7	175	168.2	48.2	235	225.9	64.8	295	283.5	81.3
56	53.8	15.4	116	111.5	32.0	176	169.2	48.5	236	226.8	65.0	296	284.5	81.6
57	54.8	15.7	117	112.5	32.2	177	170.1	48.8	237	227.8	65.3	297	285.5	81.9
58	55.7	16.0	118	113.4	32.5	178	171.1	49.1	238	228.7	65.6	298	286.4	82.1
59	56.7	16.3	119	114.4	32.8	179	172.0	49.3	239	229.7	65.9	299	287.4	82.4
60	57.7	16.5	120	115.3	33.1	180	173.0	49.6	240	230.7	66.1	300	288.3	82.7
Diſt.	Dep.	Lat.	Diſt	Dep	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.

For 74 Degrees.

Difference of Latitude and Departure for 17 Degrees.

Diſt.	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.
1	01.0	00.3	61	58.3	17.8	121	115.7	35.4	181	173.1	52.9	241	230.5	70.4
2	01.9	00.6	62	59.3	18.1	122	116.7	35.7	182	174.0	53.2	242	231.4	70.7
3	02.9	00.9	63	60.2	18.4	123	117.6	36.0	183	175.0	53.5	243	232.4	71.0
4	03.8	01.2	64	61.2	18.7	124	118.6	36.2	184	175.9	53.8	244	233.3	71.3
5	04.8	01.5	65	62.2	19.0	125	119.5	36.5	185	176.9	54.1	245	234.3	71.6
6	05.7	01.8	66	63.1	19.3	126	120.5	36.8	186	177.9	54.4	246	235.2	71.9
7	06.7	02.0	67	64.1	19.6	127	121.4	37.1	187	178.8	54.7	247	236.2	72.1
8	07.6	02.3	68	65.0	19.9	128	122.4	37.4	188	179.8	55.0	248	237.1	72.4
9	08.6	02.6	69	66.0	20.2	129	123.4	37.7	189	180.7	55.2	249	238.1	72.7
10	09.6	02.9	70	66.9	20.5	130	124.3	38.0	190	181.7	55.5	250	239.1	73.0
11	10.5	03.2	71	67.9	20.8	131	125.3	38.3	191	182.6	55.8	251	240.0	73.3
12	11.5	03.5	72	68.8	21.0	132	126.2	38.6	192	183.6	56.1	252	241.0	73.6
13	12.4	03.8	73	69.8	21.3	133	127.2	38.9	193	184.6	56.4	253	241.9	73.9
14	13.4	04.1	74	70.8	21.6	134	128.1	39.2	194	185.5	56.7	254	242.9	74.1
15	14.3	04.4	75	71.7	21.9	135	129.1	39.5	195	186.5	57.0	255	243.8	74.4
16	15.3	04.7	76	72.7	22.2	136	130.0	39.8	196	187.4	57.3	256	244.8	74.7
17	16.3	05.0	77	73.6	22.5	137	131.0	40.0	197	188.4	57.6	257	245.8	75.0
18	17.2	05.3	78	74.6	22.8	138	132.0	40.3	198	189.3	57.9	258	246.7	75.3
19	18.2	05.6	79	75.5	23.1	139	132.9	40.6	199	190.3	58.2	259	247.7	75.6
20	19.1	05.8	80	76.5	23.4	140	133.9	40.9	200	191.2	58.5	260	248.6	75.9
21	20.1	06.1	81	77.5	23.7	141	134.8	41.2	201	192.2	58.8	261	249.6	76.2
22	21.0	06.4	82	78.4	24.0	142	135.8	41.5	202	193.2	59.0	262	250.5	76.5
23	22.0	06.7	83	79.4	24.3	143	136.7	41.8	203	194.1	59.3	263	251.5	76.8
24	22.9	07.0	84	80.3	24.6	144	137.7	42.1	204	195.1	59.6	264	252.4	77.1
25	23.9	07.3	85	81.3	24.8	145	138.7	42.4	205	196.0	59.9	265	253.4	77.4
26	24.9	07.6	86	82.2	25.1	146	139.6	42.7	206	197.0	60.2	266	254.4	77.7
27	25.8	07.9	87	83.2	25.4	147	140.6	43.0	207	197.9	60.5	267	255.3	77.9
28	26.8	08.2	88	84.1	25.7	148	141.5	43.3	208	198.9	60.8	268	256.3	78.2
29	27.7	08.5	89	85.1	26.0	149	142.5	43.6	209	199.9	61.1	269	257.2	78.5
30	28.7	08.8	90	86.1	26.3	150	143.4	43.8	210	200.8	61.4	270	258.2	78.8
31	29.6	09.1	91	87.0	26.6	151	144.4	44.1	211	201.8	61.7	271	259.1	79.1
32	30.6	09.4	92	88.0	26.9	152	145.3	44.4	712	202.7	62.0	272	260.1	79.4
33	31.6	09.6	93	88.9	27.2	153	146.3	44.7	213	203.7	62.3	273	261.1	79.7
34	32.5	09.9	94	89.9	27.5	154	147.3	45.0	214	204.6	62.6	274	262.0	80.0
35	33.5	10.2	95	90.8	27.8	155	148.2	45.3	215	205.6	62.8	275	263.0	80.3
36	34.4	10.5	96	91.8	28.1	156	149.2	45.6	216	206.5	63.1	276	263.9	80.6
37	35.4	10.8	97	92.8	28.4	157	150.1	45.9	217	207.5	63.4	277	264.9	80.9
38	36.3	11.1	98	93.7	28.6	158	151.1	46.2	218	208.5	63.7	278	265.8	81.2
39	37.3	11.4	99	94.7	28.9	159	152.0	46.5	219	209.5	64.0	279	266.8	81.5
40	38.2	11.7	100	95.6	29.2	160	153.0	46.8	220	210.4	64.3	280	267.7	81.7
41	39.2	12.0	101	96.6	29.5	161	154.0	47.1	221	211.3	64.6	281	268.7	82.0
42	40.2	12.3	102	97.5	29.8	162	154.9	47.4	222	212.3	64.9	282	269.7	82.3
43	41.1	12.6	103	98.5	30.1	163	155.9	47.6	223	213.2	65.2	283	270.6	82.6
44	42.1	12.9	104	99.4	30.4	164	156.8	47.9	224	214.2	65.5	284	271.6	82.9
45	43.0	13.2	105	100.4	30.7	165	157.8	48.2	225	215.2	65.8	285	272.5	83.2
46	44.0	13.4	106	101.4	31.0	166	158.7	48.5	226	216.1	66.1	286	273.5	83.5
47	44.9	13.7	107	102.3	31.3	167	159.7	48.8	127	217.1	66.4	287	274.4	83.8
48	45.9	14.0	108	103.3	31.6	168	160.6	49.1	228	218.0	66.6	288	275.4	84.1
49	46.9	14.3	109	104.2	31.9	169	161.6	49.4	229	219.0	66.9	289	276.4	84.4
50	47.8	14.6	110	105.2	32.2	170	162.8	49.7	230	219.9	67.2	290	277.3	84.7
51	48.8	14.9	111	106.1	32.4	171	163.5	50.0	231	220.9	67.5	291	278.3	85.0
52	49.7	15.2	112	107.1	32.7	172	164.5	50.3	232	221.8	67.8	292	279.2	85.3
53	50.7	15.5	113	108.1	33.0	173	165.4	50.6	233	222.8	68.1	293	280.2	85.5
54	51.6	15.8	114	109.0	33.3	174	166.4	50.9	234	223.8	68.4	294	281.1	85.8
55	52.6	16.1	115	110.0	33.6	175	167.3	51.2	235	224.7	68.7	295	282.1	86.1
56	53.5	16.4	116	110.9	33.9	176	168.3	51.4	236	225.7	69.0	296	283.0	86.4
57	54.5	16.7	117	111.9	34.2	177	169.3	51.7	237	226.6	69.3	297	284.0	86.7
58	55.5	17.0	118	112.8	34.5	178	170.2	52.0	238	227.6	69.6	298	285.0	87.0
59	56.4	17.2	119	113.8	34.8	179	171.2	52.3	239	228.5	69.9	299	285.9	87.3
60	57.4	17.5	120	114.7	35.1	180	172.1	52.6	240	229.5	60.2	300	286.9	87.6
Diſt.	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.

for 73 Degrees.

Difference of Latitude and Departure for 18 Degrees.

Diſt.	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.
1	01.0	00.3	61	58.0	18.8	121	115.1	37.4	181	172.1	55.9	241	229.2	74.5
2	02.9	00.6	62	59.0	19.2	122	116.0	37.7	182	173.1	56.2	242	230.1	74.8
3	03.9	00.9	63	59.9	19.5	123	117.0	38.0	183	174.0	56.5	243	231.1	75.1
4	03.8	01.2	64	60.9	19.8	124	117.9	38.3	184	175.0	56.9	244	232.0	75.4
5	04.8	01.5	65	61.8	20.1	125	118.9	38.6	185	175.9	57.2	245	233.0	75.7
6	05.7	01.9	66	62.8	20.4	126	119.8	38.9	186	176.9	57.5	246	233.9	76.0
7	06.7	02.2	67	63.7	20.7	127	120.8	39.2	187	177.8	57.8	247	234.9	76.3
8	07.6	02.5	68	64.7	21.0	128	121.7	39.6	188	178.8	58.1	248	235.8	76.6
9	08.6	02.8	69	65.6	21.3	129	122.7	39.9	189	179.7	58.4	249	236.8	76.9
10	09.5	03.1	70	66.6	21.6	130	123.6	40.2	190	180.7	58.7	250	237.8	77.3
11	10.5	03.4	71	67.5	21.9	131	124.6	40.5	191	181.6	59.0	251	238.7	77.6
12	11.4	03.7	72	68.5	22.2	132	125.5	40.8	192	182.6	59.3	252	239.7	77.9
13	12.4	04.0	73	69.4	22.6	133	126.5	41.1	193	183.5	59.6	253	240.6	78.2
14	13.3	04.3	74	70.4	22.9	134	127.4	41.4	194	184.5	59.9	254	241.6	78.5
15	14.3	04.6	75	71.3	23.2	135	128.4	41.7	195	185.4	60.3	255	242.5	78.8
16	15.2	04.9	76	72.3	23.5	136	129.3	42.0	196	186.4	60.6	256	243.5	79.1
17	16.2	05.3	77	73.2	23.8	137	130.3	42.3	197	187.3	60.9	257	244.4	79.4
18	17.1	05.6	78	74.2	24.1	138	131.2	42.6	198	188.3	61.2	258	245.4	79.7
19	18.1	05.9	79	75.1	24.4	139	132.2	43.0	199	189.2	61.5	259	246.3	80.0
20	19.0	06.2	80	76.1	24.7	140	133.1	43.3	200	190.2	61.8	260	247.3	80.3
21	20.0	06.5	81	77.0	25.0	141	134.1	43.6	201	191.2	62.1	261	248.2	80.6
22	20.9	06.8	82	78.0	25.3	142	135.0	43.9	202	192.1	62.4	262	249.2	81.0
23	21.9	07.1	83	78.9	25.6	143	136.0	44.2	203	193.1	62.7	263	250.1	81.3
24	22.8	07.4	84	79.9	26.0	144	136.9	44.5	204	194.0	63.0	264	251.1	81.6
25	23.8	07.7	85	80.8	26.3	145	137.9	44.8	205	195.0	63.3	265	252.0	81.9
26	24.7	08.0	86	81.8	26.6	146	138.8	45.1	206	195.9	63.7	266	253.0	82.2
27	25.7	08.3	87	82.7	26.9	147	139.8	45.4	207	196.9	64.0	267	253.9	82.5
28	26.6	08.7	88	83.7	27.2	148	140.7	45.7	208	197.8	64.3	268	254.9	82.8
29	27.6	09.0	89	84.6	27.5	149	141.7	46.0	209	198.8	64.6	269	255.8	83.1
30	28.5	09.3	90	85.6	27.8	150	142.7	46.4	210	199.7	64.9	270	256.8	83.4
31	29.5	09.6	91	86.5	28.1	151	143.6	46.7	211	200.7	65.2	271	257.7	83.7
32	30.4	09.9	92	87.5	28.4	152	144.6	47.0	212	201.6	65.5	272	258.7	84.0
33	31.4	10.2	93	88.4	28.7	153	145.5	47.3	213	202.6	65.8	273	259.6	84.4
34	32.3	10.5	94	89.4	29.0	154	146.5	47.6	214	203.5	66.1	274	260.6	84.7
35	33.3	10.8	95	90.3	29.4	155	147.4	47.9	215	204.5	66.4	275	261.5	85.0
36	34.2	11.1	96	91.3	29.7	156	148.4	48.2	216	205.4	66.7	276	262.5	85.3
37	35.2	11.4	97	92.2	30.0	157	149.3	48.5	217	206.4	67.1	277	263.4	85.6
38	36.1	11.7	98	93.2	30.3	158	150.3	48.8	218	207.3	67.4	278	264.4	85.9
39	37.1	12.1	99	94.1	30.6	159	151.2	49.1	219	208.3	67.7	279	265.3	86.2
40	38.0	12.4	100	95.1	30.9	160	152.2	49.4	220	209.2	68.0	280	266.3	86.5
41	39.0	12.7	101	96.1	31.2	161	153.1	49.7	221	210.2	68.3	281	267.2	86.8
42	39.9	13.0	102	97.0	31.5	162	154.1	50.1	222	211.1	68.6	282	268.2	87.1
43	40.9	13.3	103	98.0	31.8	163	155.0	50.4	223	212.1	68.9	283	269.1	87.4
44	41.8	13.6	104	98.9	32.1	164	156.0	50.7	224	213.0	69.2	284	270.1	87.8
45	42.8	13.9	105	99.9	32.4	165	156.9	51.0	225	214.0	69.5	285	271.0	88.1
46	43.7	14.2	106	100.8	32.8	166	157.9	51.3	226	214.9	69.8	286	272.0	88.4
47	44.7	14.5	107	101.8	33.1	167	158.8	51.6	227	215.9	70.1	287	272.9	88.7
48	45.6	14.8	108	102.7	33.4	168	159.8	51.9	228	216.8	70.5	288	273.8	89.0
49	46.6	15.1	109	103.7	33.7	169	160.7	52.2	229	217.8	70.8	289	274.8	89.3
50	47.6	15.5	110	104.6	34.0	170	161.7	52.5	230	218.7	71.1	290	275.8	89.6
51	48.5	15.8	111	105.6	34.3	171	162.6	52.8	231	219.7	71.4	291	276.7	89.9
52	49.5	16.1	112	106.5	34.6	172	163.6	53.1	232	220.6	71.7	292	277.7	90.2
53	50.4	16.4	113	107.5	34.9	173	164.5	53.5	233	221.6	72.0	293	278.6	90.5
54	51.4	16.7	114	108.4	35.2	174	165.5	53.8	234	222.5	72.3	294	279.6	90.8
55	52.3	17.0	115	109.4	35.5	175	166.4	54.1	235	223.5	72.6	295	280.5	91.2
56	53.3	17.3	116	110.3	35.8	176	167.4	54.4	236	224.4	72.9	296	281.5	91.5
57	54.2	17.6	117	111.3	36.2	177	168.3	54.7	237	225.4	73.2	297	282.4	91.8
58	55.2	17.9	118	112.2	36.5	178	169.3	55.0	238	226.3	73.5	298	283.4	92.1
59	56.1	18.2	119	113.2	36.8	179	170.2	55.3	239	227.3	73.9	299	284.3	92.4
60	57.1	18.5	120	114.1	37.1	180	171.2	55.6	240	228.2	74.2	300	285.3	92.7
Diſt.	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.

for 72 Degrees.

Difference of Latitude and Departure for 19 Degrees.

Dift.	Lat.	Dep.	Dift	Lat.	Dep.	Dift	Lat.	Dep.	Dift	Lat.	Dep.	Dift	Lat.	Dep.
1	00.9	00.3	61	57.7	19.9	121	114.4	39 4	181	171.1	58.9	241	227 9	78.5
2	01.9	00.7	62	58.6	20.2	122	115.3	39.7	182	172.1	59.3	242	228.8	78.8
3	02.8	01.0	63	59.6	20.5	123	116.3	40.0	183	173.0	59.6	243	229.7	79.1
4	03.8	01.3	64	60.5	20.8	124	117.2	40.4	184	174.0	59.9	244	230.7	79.4
5	04.7	01.6	65	61.5	21.2	125	118.2	40.7	185	174.9	60.2	245	231.6	79.8
6	05.7	02.0	66	62.4	21.5	126	119.1	41.0	186	175.9	60.6	246	232.6	80.1
7	06.6	02.3	67	63.3	21.8	127	120.1	41.4	187	176.8	60.9	247	233.5	80.4
8	07.6	02.6	68	64.3	22.1	128	121.0	41.7	188	177.7	61.2	248	234.5	80.7
9	08.5	02.9	69	65.2	22.5	129	122.0	42.0	189	178.7	61.5	249	235.4	81.1
10	09.5	03.3	70	66.2	22.8	130	122.9	42.3	190	179.6	61.9	250	236.4	81.4
11	10.4	03.6	71	67.1	23.1	131	123 9	42.7	191	180.6	62.2	251	237.3	81.7
12	11.3	03.9	72	68.1	23.4	132	124 8	43.0	192	181.5	62.5	252	238.3	82.1
13	12.3	04.2	73	69.0	23.8	133	125.7	43.3	193	182.5	62.8	253	239.2	82.4
14	13.2	04.6	74	70.0	24.1	134	126.7	43.6	194	183.4	63.2	254	240.1	82.7
15	14.2	04.9	75	70.9	24.4	135	127.6	44.0	195	184.4	63.5	255	241.1	83.0
16	15.1	05.2	76	71.0	24.7	136	128.6	44.3	196	185.3	63.8	256	242.0	83.4
17	16.1	05.5	77	72.8	25.1	137	129.5	44 6	197	186.3	64.1	257	243.0	83.7
18	17.0	05.9	78	73.7	25.4	138	130.5	44.9	198	187.2	64.5	258	243.9	84.0
19	18.0	06.2	79	74.7	25.7	139	131.4	45.3	199	188.1	64.8	259	244.9	84.3
20	18.9	26.5	80	75.6	26.0	140	132.4	45.6	200	189.1	65.1	260	245.8	84.7
21	19.9	06.8	81	76.6	26.4	141	133.3	45.9	201	190.0	65.4	261	246.8	85.0
22	20.8	07.2	82	77.5	26.7	142	134.3	46.2	202	191.0	65.8	262	247.7	85.3
23	21.7	07.5	83	78.5	27.0	143	135.2	46.6	203	191.9	66.1	263	248.7	85.6
24	22.7	07.8	84	79.4	27.4	144	136.1	46.9	204	192.9	66.4	264	249.6	86.0
25	23.6	08.1	85	80.4	7.7	145	137.1	47.2	205	193.8	66.7	265	250.5	86.3
26	24.6	08.5	86	81.3	28.0	146	138.0	47.5	206	194.8	67.1	266	251.5	86.6
27	25.5	08.8	87	82.3	28.3	147	139.0	47.9	207	195.7	67.4	267	252.4	86.9
28	26.5	09.1	88	83.2	28.7	148	139.9	48.2	208	196.7	67.7	268	253.4	87.3
29	27.4	09.4	89	84.1	29.0	149	140.9	48.5	209	197.6	68.1	269	254.3	87.6
30	28.4	09.8	90	85.1	29.3	150	141.8	48.8	210	198.5	68.4	270	255.3	87.9
31	29.3	10.1	91	86.0	29.6	151	142 8	49.2	211	199.5	68.7	271	256.2	88.2
32	30.3	10.4	92	87.0	30.0	152	143.7	49.5	212	200.4	69.0	272	257.2	88.6
33	31.2	10.7	93	87.9	30.3	153	144.7	49.8	213	201.4	69.4	273	258.1	88.9
34	32.1	11.1	94	88.9	30.6	154	145.6	50.1	214	202.3	69.7	274	259.1	89.2
35	33.1	11.4	95	89.8	30.9	155	146.5	50.5	215	203.3	70.0	275	260.0	89.5
36	34.0	11.7	96	90.8	31.3	156	147.5	50.8	216	204.2	70.3	276	260.9	89.9
37	35.0	12.0	97	91.7	31.6	157	148.4	51.1	217	205.2	70.7	277	261.9	90.2
38	35.9	12.4	98	92.7	31.9	158	149.4	51.4	218	206.1	71.0	278	262.8	90.5
39	36.9	12.7	99	93.6	32.2	159	150.3	51.8	219	207.1	71.3	279	263.8	90.8
40	37.8	13.0	100	94.5	32.6	160	151.3	52.1	220	208.0	71.6	280	264.7	91.2
41	38.8	13.3	101	95.5	32.9	161	152.2	52.4	221	208.9	72.0	281	265.7	91.5
42	39.7	13.7	102	96.4	33.2	162	153.2	52.7	222	209.9	72.3	282	266.6	91.8
43	40.7	14.0	103	97.4	33.5	163	154.1	53.1	223	210.8	72.6	283	267.6	92.1
44	41.6	14.3	104	98.3	33.9	164	155.1	53.4	224	211.8	72.9	284	268.5	92.5
45	42.5	14.7	105	99.3	34.2	165	156.0	53.7	225	212.7	73.3	285	269.5	92.8
46	43.5	15.0	106	100.2	34.5	166	157.9	54.0	226	213.7	73.6	286	270.4	93.1
47	44.4	15.3	107	101.2	34.8	167	158.9	54.4	227	214.6	73.9	287	271.3	93.4
48	45.4	15.6	108	102.1	35.2	168	159.8	54.7	228	215.6	74.2	288	272.3	93.8
49	46.3	16.0	109	103.1	35.5	169	160.8	55.0	229	216.5	74.6	289	273.2	94.1
50	47.3	16.3	110	104.0	35.8	170	161.7	55.4	230	217.5	74.9	290	274.2	94.4
51	48.2	16.6	111	104.9	36.1	171	161.7	55.7	231	218.4	35.2	291	275.1	94.7
52	49.2	16.9	112	105.9	36.5	172	162.6	56.0	232	219.3	75.5	292	276.1	95.1
53	50.1	17.3	113	106.8	36.8	173	163.6	56.3	238	220.3	75.9	293	277.0	95.4
54	51.1	17.6	114	107.8	37.1	174	164.5	56.7	234	221.2	76.2	294	278.0	95.7
95	52.0	17.9	115	108.7	37.4	175	165.5	57.0	235	222.2	76.5	295	278.9	96.1
56	52.9	18.2	116	109.7	37.8	176	166.4	57.3	236	223.1	76.8	296	279.9	96.4
57	53.9	18.6	117	110.6	38.1	177	167.3	57.6	237	224.1	77.2	297	280.8	96.7
58	54.8	18.9	118	111.6	38.4	178	168.3	58.0	238	225.0	77.5	298	281.7	97.0
59	55.8	19.2	119	112.5	38.7	179	169.2	58.3	239	226.0	77.8	299	282.7	97.4
60	56.7	19.5	120	113.5	39.1	180	170.2	58.6	240	226 9	78.1	300	283.6	97.7
Dift.	Dep.	Lat.	Dift	Dep.	Lat.	Dift	Dep.	Lat.	Dift	Dep	Lat.	Dift	Dep.	Lat.

for 71 Degrees.

Difference of Latitude and Departure for 20 Degrees.

Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep
1	00.9	00.3	61	57.3	20.9	121	113.7	41.4	181	179.1	61.9	241	226.5	82.4
2	01.9	00.7	62	58.3	21.2	122	114.6	41.7	182	170.0	62.2	242	227.4	82.8
3	02.8	01.0	63	59.2	21.5	123	115.6	42.1	183	171.0	62.6	243	228.3	83.1
4	03.8	01.4	64	60.1	21.9	124	116.5	42.4	184	172.9	62.9	244	229.3	83.4
5	04.7	01.7	65	61.1	22.2	125	117.5	42.8	185	173.8	63.3	245	230.2	83.8
6	05.6	02.1	66	62.0	22.6	126	118.4	43.1	186	174.8	63.6	246	231.2	84.1
7	06.6	02.4	67	63.0	22.9	127	119.3	43.4	187	175.7	64.0	247	232.1	84.5
8	07.5	02.7	68	63.9	23.3	128	120.3	43.8	188	176.7	64.3	248	233.0	84.8
9	08.5	03.1	69	64.8	23.6	129	121.2	44.1	189	177.6	64.6	249	234.0	85.2
10	09.4	03.4	70	65.8	23.9	130	122.2	44.5	190	178.5	65.0	250	234.9	85.5
11	10.3	03.8	71	66.7	24.3	131	123.1	44.8	191	179.5	65.3	251	235.9	85.8
12	11.3	04.1	72	67.7	24.6	132	124.0	45.1	192	180.4	65.7	252	236.8	86.2
13	12.2	04.4	73	68.6	25.0	133	125.0	45.5	193	181.4	66.0	253	237.7	86.5
14	13.2	04.8	74	69.5	25.3	134	125.9	45.8	194	182.3	66.3	254	238.7	86.9
15	14.1	05.1	75	70.5	25.7	135	126.9	46.2	195	183.2	66.7	255	239.6	87.2
16	15.0	05.5	76	71.4	26.0	136	127.8	46.5	196	184.2	67.0	256	240.6	87.6
17	16.0	05.8	77	72.4	26.3	137	128.7	46.9	197	185.1	67.4	257	241.5	87.9
18	16.9	06.2	78	73.3	26.7	138	129.7	47.2	198	186.1	67.7	258	242.4	88.2
19	17.9	06.5	79	74.2	27.0	139	130.6	47.5	199	187.0	68.1	259	243.4	88.6
20	18.8	06.8	80	75.2	27.4	140	131.6	47.9	200	187.9	68.4	260	244.3	88.9
21	19.7	07.2	81	76.1	27.7	141	132.5	48.2	201	188.9	68.7	261	245.3	89.3
22	20.7	07.5	82	77.1	28.0	142	133.4	48.6	202	189.8	69.1	262	246.2	89.6
23	21.6	07.9	83	78.0	28.4	143	134.4	48.9	203	190.8	69.4	263	247.1	89.9
24	22.6	08.2	84	78.9	28.7	144	135.3	49.2	204	191.7	69.8	264	248.1	90.3
25	23.5	08.6	85	79.9	29.1	145	136.3	49.6	205	192.6	70.1	265	249.0	90.6
26	24.4	08.9	86	80.8	29.4	146	137.2	49.9	206	193.6	70.5	266	250.0	91.0
27	25.4	09.2	87	81.8	29.8	147	138.1	50.3	207	194.5	70.8	267	250.9	91.3
28	26.3	09.6	88	82.7	30.1	148	139.1	50.6	208	195.5	71.1	268	251.8	91.7
29	27.3	09.9	89	83.6	30.4	149	140.0	51.0	209	196.4	71.5	269	252.8	92.0
30	28.2	10.3	90	84.6	30.8	150	141.0	51.3	210	197.3	71.8	270	253.7	92.3
31	29.1	10.6	91	85.5	31.1	151	141.9	51.6	211	198.3	72.2	271	254.7	92.7
32	30.1	10.9	92	86.5	31.5	152	142.8	52.0	212	199.2	72.5	272	255.6	93.0
33	31.0	11.3	93	87.4	31.8	153	143.8	52.3	213	200.2	72.8	273	256.5	93.4
34	31.9	11.6	94	88.3	32.1	154	144.7	52.7	214	201.1	73.2	274	257.5	93.7
35	32.9	12.0	95	89.3	32.5	155	145.7	53.0	215	202.0	73.5	275	258.4	94.1
36	33.8	12.3	96	90.2	32.8	156	146.6	53.4	216	203.0	73.9	276	259.4	94.4
37	34.8	12.7	97	91.2	33.2	157	147.5	53.7	217	203.9	74.2	277	260.3	94.7
38	35.7	13.0	98	92.1	33.5	158	148.5	54.0	218	204.9	74.6	278	261.2	95.1
39	36.6	13.3	99	93.0	33.9	159	149.4	54.4	219	205.8	74.9	279	262.2	95.4
40	37.6	13.7	100	94.0	34.2	160	150.4	54.7	220	206.7	75.2	280	263.1	95.8
41	38.5	14.0	101	94.9	34.5	161	151.3	55.1	221	207.7	75.6	281	264.1	96.1
42	39.5	14.4	102	95.8	34.9	162	152.2	55.4	222	208.6	75.9	282	265.0	96.4
43	40.4	14.7	103	96.8	35.2	163	153.2	55.7	223	209.6	76.3	283	265.9	96.8
44	41.3	15.0	104	97.7	35.6	164	154.1	56.1	224	210.5	76.6	284	266.9	97.1
45	42.3	15.4	105	98.7	35.9	165	155.1	56.4	225	211.4	77.0	285	267.8	97.5
46	43.2	15.7	106	99.6	36.3	166	156.0	56.8	226	212.4	77.3	286	268.8	97.8
47	44.2	16.1	107	100.5	36.6	167	156.9	57.1	227	213.3	77.6	287	269.7	98.2
48	45.1	16.4	108	101.5	36.9	168	157.9	57.5	228	214.3	78.0	288	270.6	98.5
49	46.0	16.8	109	102.4	37.3	169	158.8	57.8	229	215.2	78.3	289	271.6	98.8
50	47.0	17.1	110	103.4	37.6	170	159.7	58.1	230	216.1	78.7	290	272.5	99.2
51	47.9	17.4	111	104.3	38.0	171	160.7	58.5	231	217.1	79.0	291	273.5	99.5
52	48.9	17.8	112	105.2	38.3	172	161.6	58.8	232	218.0	79.3	292	274.4	99.9
53	49.8	18.1	113	106.2	38.6	173	162.6	59.2	233	219.0	79.7	293	275.3	100.2
54	50.7	18.5	114	107.1	39.0	174	163.5	59.5	234	219.9	80.0	294	276.3	100.5
55	51.7	18.8	115	108.1	39.3	175	164.4	59.9	235	220.8	80.4	295	277.2	100.9
56	52.6	19.2	116	109.0	39.7	176	165.4	60.2	236	221.8	80.7	296	278.2	101.1
57	53.6	19.5	117	109.9	40.0	177	166.3	60.5	237	222.7	81.1	297	279.1	101.6
58	54.5	19.8	118	110.9	40.4	178	167.3	60.9	238	223.6	81.4	298	280.0	101.9
59	55.4	20.2	119	111.8	40.7	179	168.2	61.2	239	224.6	81.7	299	281.0	102.3
60	56.4	20.5	120	112.8	41.0	180	169.1	61.6	240	225.5	82.1	300	281.9	102.6
Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.

for 70 Degrees.

Difference of Latitude and Departure for 21 Degrees.

Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.
1	00.9	00.4	61	56.9	21.9	121	113.0	43.4	181	169.0	64.9	141	225.0	86.4
2	01.9	00.7	62	57.9	22.2	122	113.9	43.7	182	169.9	65.2	242	225.9	86.7
3	02.8	01.1	63	58.8	22.6	123	114.9	44.1	183	170.9	65.6	243	226.9	87.1
4	03.7	01.4	64	59.7	22.9	124	115.8	44.4	184	171.8	65.9	244	227.8	87.4
5	04.7	01.8	65	60.7	23.3	125	116.7	44.8	185	172.7	66.3	245	228.7	87.8
6	05.6	02.2	66	61.6	23.7	126	117.7	45.2	186	173.7	66.7	246	229.7	88.2
7	06.5	02.5	67	62.5	24.0	127	118.6	45.5	187	174.6	67.0	247	230.6	88.5
8	07.5	02.9	68	63.5	24.4	128	119.5	45.9	188	175.5	67.4	248	231.5	88.9
9	08.4	03.2	69	64.4	24.7	129	120.5	46.2	189	176.5	67.7	249	232.5	89.2
10	09.3	03.6	70	65.3	25.1	130	121.4	46.6	190	177.4	68.1	250	233.4	89.6
11	10.3	03.9	71	66.3	25.4	131	122.3	47.0	191	178.3	68.5	251	234.3	90.0
12	11.2	04.3	72	67.2	25.8	132	123.3	47.3	192	179.3	68.8	252	235.3	90.3
13	12.1	04.6	73	68.1	26.2	133	124.2	47.7	193	180.2	69.2	253	236.2	90.7
14	13.1	05.0	74	69.1	26.5	134	125.1	48.0	194	181.1	69.5	254	237.1	91.0
15	14.0	05.4	75	70.0	26.9	135	126.1	48.4	195	182.1	69.9	255	238.1	91.4
16	14.9	05.7	76	70.9	26.2	136	127.0	48 7	196	183.0	70.2	256	239.0	91.8
17	15.9	06.1	77	71.9	27.6	137	127.9	49.1	197	183.9	70.6	257	239.9	92.1
18	16.8	06.5	78	72.8	28.0	138	128.9	49.5	198	184.9	71.0	258	240.9	92.5
19	17.7	06.8	79	73.7	28.3	139	129.8	49.8	199	185.8	71.3	259	241.8	92.8
20	18.7	07.2	80	74.7	28.7	140	130.7	50.2	200	186.7	71.7	260	242.7	93.2
21	19.6	07.5	81	75.6	29.0	141	131.7	50.5	201	187.6	72.0	261	243.7	93.5
22	20.5	07.9	82	76.5	29.4	142	132.6	50.9	202	188.6	72.4	262	244.6	93.9
23	21.5	08.2	83	77.5	29.7	143	133.5	51.3	203	189.5	72.8	263	245.5	94.2
24	22.4	08.6	84	78.4	30.1	144	134.5	51.6	204	190.4	73.1	264	246.5	94.6
25	23.3	09.0	85	79.3	30.5	145	135.4	52.0	205	191.4	73.5	265	247.4	95.0
26	24.3	09.3	86	80.3	30.8	146	136.3	52.3	206	192.3	73.8	266	248.3	95.3
27	25.2	09.7	87	81.2	31.2	147	137.3	52.7	207	193.2	74.2	267	249.3	95.7
28	26.1	10.0	88	82.1	31.5	148	138.2	53.0	208	194.2	74.5	268	250.2	96.1
29	27.1	10.4	89	83.1	31.9	149	139.1	53.4	209	195.1	74.9	269	251.1	96.4
30	28.0	10.8	90	84.0	32.3	150	140.1	53.8	210	196.0	75.3	270	252.1	96.8
31	28.9	11.1	91	84.9	32.6	151	141.0	54.1	211	197.0	75.6	274	253.0	97.1
32	29.9	11.5	92	85.9	33.0	152	141.9	54.5	212	197.9	76.0	272	253.9	97.5
33	30.8	11.8	93	86.8	33.3	153	142.9	54.8	213	198.8	76.3	273	254.9	97.8
34	31.7	12.2	94	87.7	33.7	154	143.8	55.2	214	199.8	76.7	274	255.8	98.2
35	32.7	12.5	95	88.7	34.0	155	144.7	55.6	215	200.7	77.1	275	256.7	98.6
36	33.6	12.9	96	89.6	34.4	156	145.7	55.9	216	201.6	77.3	276	257.7	98.9
37	34.5	13.3	97	90.5	34.8	157	146.6	56.3	217	202.6	77.8	277	258.6	99.3
38	35.5	13.6	98	91 5	35.1	158	147.5	56.6	218	203.5	78.1	278	259.5	99.6
39	36.4	14.0	99	92.4	35.5	159	148.5	57.0	219	204.4	78.5	279	260.5	100.0
40	37.3	14.3	100	93.4	35.8	160	149.4	57.3	220	205.4	78.8	280	261.4	100.4
41	38.3	14.7	101	94.3	36.2	161	150.3	57.7	221	206.3	79.2	281	262.3	100.7
42	39.2	15.1	102	95.3	36.6	162	151.3	58.1	222	207.2	79.6	282	263.3	101.1
43	40.1	15 4	103	96.2	36.9	163	152.2	58.4	223	208.2	79.9	283	264.2	101.4
44	41.1	15.8	104	97.1	37.3	164	153.1	58.8	224	209.1	80.3	284	265.1	101.8
45	42.0	16.1	105	98.1	37.6	165	154.1	59.1	225	210.0	80.6	285	266.1	102.1
46	42.9	16.5	106	99.0	38.0	166	155.0	59.5	226	211.0	81.0	285	267.0	102.5
47	43.9	16.8	107	99.9	38.3	167	155.9	59.9	227	211.9	81.4	287	267.9	102.9
48	44.8	17.2	108	100.9	38.7	168	156.9	60.2	228	212.8	81.7	288	268.9	103.2
49	45.7	17.6	109	101.8	39.1	169	157.8	60.6	229	213.8	82.1	289	269.8	103.6
50	46.7	17.9	110	102.7	39.4	170	158.7	60.9	230	214.7	82.4	290	270.7	103.9
51	47.6	18.3	111	103.7	39.8	171	159.7	61.3	231	215.6	82.8	291	271.7	104.3
52	48.5	18.6	112	104.6	40.1	172	160.6	61.6	232	216.6	83.1	292	272.6	104.7
53	49.5	19.0	113	105.5	40.5	173	161.5	62.0	233	217.5	83.5	293	273.5	105.0
54	50.4	19.4	114	106.5	40.9	174	162.5	62.4	234	218.4	83.9	294	274.5	105.4
55	51.3	19.7	115	107.4	41.2	175	163.4	62.7	235	219.4	84.2	295	275.4	105.7
56	52.3	20.1	116	108.3	41.6	176	164.3	63.1	236	220.3	84.6	296	276.3	106.1
57	53.2	20.4	117	109.3	41.9	177	165.3	63.4	237	221.2	84.9	297	277.3	106.4
58	54.1	20.8	118	110.2	42.3	178	166.2	63.8	238	222.2	85.3	298	278.2	106.8
59	55.1	21.1	119	111.1	42.6	179	167.1	64.2	239	223.1	85.7	299	279.1	107.2
60	56.0	21.5	120	112.1	43.0	180	168.1	64.5	240	224.1	86.0	300	280.1	107.5
Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.

for 69 Degrees.

Difference of Latitude and Departure for 22 Degrees.

Dift.	Lat.	Dep.	Dift	Lat.	Dep.	Dift	Lat.	Dep.	Dift	Lat.	Dep.	Dift	Lat.	Dep.
1	00.9	00.4	61	56.6	22.9	121	112.2	45.3	181	167.8	67.8	241	223.5	90,3
2	01.9	00.7	62	57.5	23.2	122	113.1	45.7	182	168.8	68.2	242	224.4	90.7
3	02.8	01.1	63	58.4	23.6	123	114.0	46.1	183	169.7	68.6	243	225.3	91,0
4	03.7	01.5	64	59.3	24.0	124	115.0	46.5	184	170.6	68.9	244	226.2	91,4
5	04.6	01.9	65	60.3	24.3	125	115.9	46.8	185	171.5	69.3	245	227.2	91,8
6	05.6	02.2	66	61.2	24.7	126	116.8	47.2	186	172.5	69.7	246	228.1	92,2
7	06.5	02.6	67	62.1	25.1	127	117.8	47.6	187	173.4	70.1	247	229.0	92,5
8	07.4	03.0	68	63.0	25.5	128	118.7	47.9	188	174.3	70.4	248	229.9	92,9
9	08.3	03.4	69	64.0	25.8	129	119.6	48.3	189	175.2	70.8	249	230.9	93,3
10	09.3	03.7	70	64.9	26.2	130	120.5	48.7	190	176.2	71.2	250	231.8	93.7
11	10.2	04.1	71	65.8	26.6	131	121.5	49.1	191	177.1	71.5	251	232.7	94,0
12	11.1	04.5	72	66.8	27.0	132	122.4	49.4	192	178.0	71.9	252	233.7	94,4
13	12.1	04.9	73	67.7	27.3	133	123.3	49.8	193	178.9	72.3	253	234.6	94,8
14	13.0	05.2	74	68.6	27.7	134	124.2	50.2	194	179.8	72.7	254	235.5	95,2
15	13.9	05.6	75	69.5	28.1	135	125.2	50.6	195	180.8	73.0	255	236.4	95.5
16	14.8	06.0	76	70.5	28.5	136	126.1	50.9	196	181.7	73.4	256	237.4	95,9
17	15.8	06.4	77	71.4	28.8	137	127.0	51.3	197	182.7	73.8	257	238.3	96,3
18	16.7	06.7	78	72.3	29.2	138	128.0	51.7	198	183.6	74.2	258	239.2	96,6
19	17.6	07.1	79	73.2	29.6	139	128.9	52.1	199	184.5	74.5	259	240.1	97,0
20	18.5	07.5	80	74.2	30.0	140	129.8	52.4	200	185.4	74.9	260	241.1	97.4
21	19.5	07.9	81	75.1	30.3	141	130.7	52.8	201	186.4	75.3	261	242.0	97,8
22	20.4	08.2	82	76.0	30.7	142	131.7	53.2	202	187.3	75.7	262	242.9	98,2
23	21.3	08.6	83	77.0	31.1	143	132.6	53.6	203	188.2	76.0	263	243.9	98,5
24	22.3	09.0	84	77.9	31.5	144	133.5	53.9	204	189.1	76.4	264	244.8	98,9
25	23.2	09.4	85	78.8	31.8	145	134.4	54.3	205	190.1	76.8	265	245.7	99,3
26	24.1	09.7	86	79.7	32.2	146	135.4	54.7	206	191.0	77.2	266	246.6	99,6
27	25.0	10.1	87	80.7	32.6	147	136.3	55.1	207	191.9	77.5	267	247.6	100,0
28	26.0	10.5	88	81.6	33.0	148	137.2	55.4	208	192.9	77.9	268	248.5	100,4
29	26.9	10.9	89	82.5	33.3	149	138.2	55.8	209	193.8	78.3	269	249.4	100,8
30	27.8	11.2	90	83.4	33.7	150	139.1	56.2	210	194.7	78.7	270	250.3	101,1
31	28.7	11.6	91	84.4	34.1	151	140.0	56.6	211	195.6	79.0	271	251.3	101,5
32	29.7	12.0	92	85.3	34.5	152	140.9	56.9	212	196.6	79.4	272	252.2	101,9
33	30.6	12.4	93	86.2	34.8	153	141.9	57.3	213	197.5	79.8	273	253.1	102,3
34	31.5	12.7	94	87.2	35.2	154	142.8	57.7	214	198.4	80.2	274	254.1	102,6
35	32.5	13.1	95	88.1	35.6	155	143.7	58.1	215	199.3	80.5	275	255.0	103,0
36	33.4	13.5	96	89.0	36.0	156	144.6	58.4	216	200.3	80.9	276	255.9	103,4
37	34.3	13.9	97	89.9	36.3	157	145.6	58.8	217	201.2	81.3	277	256.8	103,8
38	35.2	14.2	98	90.9	36.7	158	146.5	59.2	218	202.1	81.7	278	257.8	104.1
39	36.2	14.6	99	91.8	37.1	159	147.4	59.6	219	203.1	82.0	279	258.7	104,5
40	37.1	15.0	100	92.7	37.5	160	148.4	59.9	220	204.0	82.4	280	259.6	104.9
41	38.0	15.4	101	93.6	37.8	161	149.3	60.3	221	204.9	82.8	281	260.5	105.3
42	38.9	15.7	102	94.6	38.2	162	150.2	60.7	222	205.8	83.2	282	261.5	105.6
43	39.9	16.1	103	95.5	38.6	163	151.1	61.1	223	206.7	83.5	283	262.4	106.0
44	40.8	16.5	104	96.4	39.0	164	152.1	61.4	224	207.7	83.9	284	263.3	106.4
45	41.7	16.9	105	97.4	39.3	165	153.0	61.8	225	208.6	84.3	285	264.3	106.8
46	42.7	17.2	106	98.3	39.7	166	153.9	62.2	226	209.5	84.7	286	265.2	107.1
47	43.6	17.6	107	99.2	40.1	167	154.8	62.6	227	210.5	85.0	287	266.1	107.5
48	44.5	18.0	108	100.1	40.5	168	155.8	62.9	228	211.4	85.4	288	267.0	107.9
49	45.4	18.4	109	101.1	40.8	169	156.7	63.3	229	212.3	85.8	289	268.0	108.3
50	46.4	18.7	110	102.0	41.2	170	157.6	63.7	230	213.3	86.2	200	268.9	108.6
51	47.3	19.1	111	102.9	41.6	171	158.6	64.1	231	214.2	86.5	291	269.8	109.0
52	48.2	19.5	112	103.8	42.0	172	159.5	64.4	232	215.1	86.9	292	270.7	109.4
53	49.1	19.9	113	104.8	42.3	173	160.4	64.8	233	216.0	87.3	293	271.7	109.8
54	50.1	20.2	114	105.7	42.7	174	161.3	65.2	234	217.0	87.7	294	272.6	110.1
95	51.0	20.6	115	106.6	43.1	175	162.3	65.6	235	217.9	88.0	295	273.5	110.5
56	51.9	21.0	116	107.6	43.5	176	163.2	65.9	236	218.8	88.4	296	274.5	110.9
57	52.9	21.4	117	108.5	43.8	177	164.1	66.3	237	219.7	88.8	297	275.4	111.3
58	53.8	21.7	118	109.4	44.2	178	165.0	66.7	238	220.7	89.2	298	276.3	111.6
59	54.7	22.1	119	110.3	44.6	179	166.0	67.1	239	221.6	89.5	299	277.2	112.0
60	55.6	22.5	120	111.3	45.0	180	166.9	67.4	24	222.5	89.9	300	278.2	112.4
Dift.	Dep.	Lat.	Dift	Dep.	Lat.	Dift	Dep.	Lat.	Dift	Dep	Lat.	Dift	Dep.	Lat.

for 68 Degrees.

Difference of Latitude and Departure for 23 Degrees.

Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.
1	00.9	00.4	61	56.1	23.8	121	111.4	47.3	181	166.6	70.7	241	221.8	94.2
2	01.8	00.8	62	57.1	24.2	122	112.3	47.7	182	167.5	71.1	242	222.8	94.5
3	02.8	01.2	63	58.0	24.6	123	113.2	48.1	183	168.5	71.5	243	223.7	94.9
4	03.7	01.6	64	58.9	25.0	124	114.1	48.4	184	169.4	71.9	244	224.6	95.3
5	04.6	02.0	65	59.8	25.4	125	115.1	48.8	185	170.3	72.3	245	223.5	95.7
6	05.5	02.3	66	60.8	25.8	126	116.0	49.2	186	171.2	72.7	246	226.4	96.1
7	06.4	02.7	67	61.7	26.2	127	116.9	49.6	187	172.2	73.1	247	227.4	96.5
8	07.4	03.1	68	62.6	26.6	128	117.8	50.0	188	173.1	73.5	248	228.3	96.9
9	08.3	03.5	69	63.5	27.0	129	118.7	50.4	189	174.0	73.8	249	229.2	97.3
10	09.2	03.9	70	64.4	27.3	130	119.7	50.8	190	174.9	74.2	250	230.1	97.7
11	10.1	08.3	71	65.4	27.7	131	120.6	51.2	191	175.8	74.6	251	231.0	98.1
12	11.0	04.7	72	66.3	28.1	132	121.5	51.6	192	176.7	75.0	252	232.0	98.5
13	12.0	05.1	73	67.2	28.5	133	122.4	52.0	193	177.7	75.4	253	232.9	98.8
14	12.9	05.5	74	68.1	28.9	134	123.3	52.4	194	178.6	75.8	254	233.8	99.2
15	13.8	05.9	75	69.0	29.3	135	124.3	52.7	195	179.5	76.2	255	234.7	99.6
16	14.7	06.3	76	70.0	29.7	136	125.2	53.1	196	180.4	76.6	256	235.6	100.0
17	15.6	06.6	77	70.9	30.1	137	126.1	53.5	197	181.3	77.0	257	236.6	100.3
18	16.6	07.0	78	71.8	30.5	138	127.0	53.9	198	182.3	77.4	258	237.5	100.8
19	17.5	07.4	79	72.7	30.9	139	127.9	54.3	199	183.2	77.7	259	238.4	101.2
20	18.4	07.8	80	73.6	31.3	140	128.9	54.7	200	184.1	78.1	260	239.3	101.6
21	19.3	08.2	81	74.6	31.6	141	129.8	55.1	201	185.0	78.5	261	240.2	102.0
22	20.3	08.6	82	75.5	32.0	142	130.7	55.5	202	185.9	78.9	262	241.2	102.4
23	21.2	09.0	83	76.4	32.4	143	131.6	55.9	203	186.9	79.3	263	242.1	102.8
24	22.1	09.4	84	77.3	32.8	144	132.6	56.3	204	187.8	79.7	264	243.0	103.1
25	23.0	09.8	85	78.2	33.2	145	133.5	56.7	205	188.7	80.1	265	243.9	103.5
26	23.9	10.2	86	79.2	33.6	146	134.4	57.0	206	189.6	80.5	266	244.9	103.9
27	24.9	10.5	87	80.1	34.0	147	135.3	57.4	207	190.5	80.9	267	245.8	104.3
28	25.8	10.9	88	81.0	34.4	148	136.2	57.8	208	191.5	81.3	268	246.7	104.7
29	26.7	11.3	89	81.9	34.8	149	137.2	58.2	209	192.4	81.7	269	247.6	105.1
30	27.6	11.7	90	82.8	35.2	150	138.1	58.6	210	193.3	82.0	270	248.5	105.5
31	28.5	12.1	91	83.8	35.6	151	139.0	59.0	211	194.2	82.4	271	249.5	105.9
32	29.5	12.5	92	84.7	35.9	152	139.9	59.4	212	195.1	82.8	272	250.4	106.3
33	30.4	12.9	93	85.6	36.3	153	140.8	59.8	213	196.1	83.2	273	251.3	106.7
34	31.3	13.3	94	86.5	36.7	154	141.8	60.2	214	197.0	83.6	274	252.2	107.1
35	32.2	13.7	95	87.4	37.1	155	142.7	60.6	215	197.9	84.0	275	253.1	107.4
36	33.1	14.1	96	88.4	37.5	156	143.6	60.9	216	198.8	84.4	276	254.1	107.8
37	34.1	14.5	97	89.3	37.9	157	144.5	61.3	217	199.7	84.8	277	255.0	108.2
38	35.0	14.8	98	90.2	38.3	158	145.4	61.7	218	200.7	85.2	278	255.9	108.6
39	35.9	15.2	99	91.1	38.7	159	146.4	62.1	219	201.6	85.6	279	256.8	109.0
40	36.8	15.6	100	92.0	39.1	160	147.3	62.5	220	202.5	86.0	280	257.7	109.4
41	37.7	16.0	101	93.0	39.5	161	148.2	62.9	221	203.4	86.3	281	258.7	109.8
42	38.7	16.4	102	93.9	39.9	162	149.1	63.3	222	204.4	86.7	282	259.6	110.2
43	39.6	16.8	103	94.8	40.2	163	150.0	63.7	223	205.3	87.1	283	260.5	110.6
44	40.5	17.2	104	95.7	40.6	164	151.9	64.1	224	206.2	87.5	284	261.4	111.0
45	41.4	17.6	105	96.7	41.0	165	151.9	64.5	225	207.1	87.9	285	262.3	111.3
46	42.3	18.0	106	97.6	41.4	166	152.8	64.9	226	208.0	88.3	286	263.3	111.7
47	43.3	18.4	107	98.5	41.8	167	153.7	65.2	227	209.0	88.7	287	264.2	112.1
48	44.2	18.8	108	99.4	42.2	168	154.6	65.6	228	209.9	89.1	288	265.1	112.5
49	45.1	19.1	109	100.3	42.6	169	155.6	66.0	229	210.8	89.5	289	266.0	112.9
50	46.0	19.5	110	101.3	43.0	170	156.5	66.4	230	211.7	89.9	290	266.9	113.3
51	46.9	19.9	111	102.2	43.4	171	157.4	66.8	231	212.6	90.3	291	267.9	113.7
52	47.9	20.3	112	103.1	43.8	172	158.3	67.2	232	213.6	90.6	292	268.8	114.1
53	48.8	20.7	113	104.0	44.1	173	159.2	67.6	233	214.5	91.0	293	269.7	114.5
54	49.7	21.1	114	104.9	44.5	174	160.2	68.0	234	215.4	91.4	294	270.6	114.9
55	50.6	21.5	115	105.9	44.9	175	161.1	68.4	235	216.3	91.8	295	271.5	115.3
56	51.5	21.9	116	106.8	45.3	176	162.0	68.8	236	217.2	92.2	296	272.5	115.7
57	52.5	22.3	117	107.7	45.7	177	162.9	69.2	237	218.2	92.6	297	273.4	116.0
58	53.4	22.7	118	108.6	46.1	178	163.8	69.5	238	219.1	93.0	298	274.3	116.4
59	54.3	23.1	119	109.5	46.5	179	164.8	69.9	239	220.0	93.4	299	275.2	116.8
60	55.2	23.4	120	110.5	46.9	180	165.7	60.3	240	220.0	93.8	300	276.2	117.2
Diſt.	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.

for 67 Degrees.

Difference of Latitude and Departure for 24 Degrees.

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	00.9	00.4	61	55.7	24.8	121	110.5	49.2	181	165.3	73.6	241	220.2	98.0
2	01.8	00.8	62	56.6	25.2	122	111.4	49.6	182	166.3	74.0	242	221.1	98.4
3	02.7	01.2	63	57.6	25.6	123	112.4	50.0	183	167.2	74.4	243	222.0	98.8
4	03.7	01.6	64	58.5	26.0	124	113.3	50.4	184	168.1	74.8	244	222.9	99.2
5	04.6	02.0	65	59.4	26.4	125	114.2	50.8	185	169.0	75.2	245	223.8	99.6
6	05.5	02.4	66	60.3	26.8	126	115.1	51.2	186	170.9	75.6	246	224.7	100.0
7	06.4	02.8	67	61.2	27.2	127	116.0	51.7	187	170.8	76.1	247	225.6	100.5
8	07.3	03.3	68	62.1	27.7	128	116.9	52.1	188	171.7	76.5	248	226.5	100.9
9	08.2	03.7	69	63.0	28.1	129	117.8	52.5	189	172.7	76.9	249	227.5	101.3
10	09.1	04.1	70	63.9	28.5	130	118.8	52.9	190	173.6	77.3	250	228.4	101.7
11	10.0	04.5	71	64.9	28.9	131	119.7	53.3	191	174.5	77.7	251	229.3	102.1
12	11.0	04.9	72	65.8	29.3	132	120.6	53.7	192	175.4	78.1	252	230.2	102.5
13	11.9	05.3	73	66.7	29.7	133	121.5	54.1	193	176.3	78.5	253	231.1	102.9
14	12.8	05.7	74	67.6	30.1	134	122.4	54.5	194	177.2	78.9	254	232.0	103.3
15	13.7	06.1	75	68.5	30.5	135	123.3	54.9	195	178.1	79.3	255	232.9	103.7
16	14.6	06.5	76	69.4	30.9	136	124.2	55.3	196	179.0	79.7	256	233.9	104.1
17	15.5	06.9	77	70.3	31.3	137	125.1	55.7	197	180.0	80.1	257	234.8	104.5
18	16.4	07.3	78	71.3	31.7	148	126.1	56.2	198	180.9	80.5	258	235.7	104.9
19	17.4	07.7	79	72.2	32.1	139	127.0	56.5	199	181.8	80.9	259	236.6	105.3
20	18.3	08.1	80	73.1	32.5	140	127.9	56.9	200	182.7	81.3	260	237.5	105.7
21	19.2	08.5	81	74.0	32.9	141	128.8	57.3	201	183.6	81.7	261	238.4	106.1
22	20.1	08.9	82	74.9	33.3	142	129.7	57.8	202	184.5	82.2	262	239.3	106.6
23	21.0	09.4	83	75.8	33.8	143	130.6	58.2	203	185.4	82.6	263	240.3	107.0
24	21.9	09.8	84	76.7	34.2	144	131.5	58.6	204	186.4	83.0	264	241.2	107.4
25	22.8	10.2	85	77.6	34.6	145	132.5	59.0	205	187.3	83.4	265	242.1	107.8
26	23.8	10.6	86	78.6	35.0	146	133.4	59.4	206	188.2	83.8	266	243.0	108.2
27	24.7	11.0	87	79.5	35.4	147	134.3	59.8	207	189.1	84.2	267	243.9	108.6
28	25.6	11.4	88	80.4	35.8	148	135.2	60.2	208	190.0	84.6	268	244.8	109.0
29	26.5	11.8	89	81.3	36.2	149	136.1	60.6	209	190.9	85.0	269	245.7	109.4
30	27.4	12.2	90	82.2	36.6	150	137.0	61.0	210	191.8	85.4	270	246.6	109.8
31	28.3	12.6	91	83.1	37.0	151	137.9	61.4	211	192.7	85.8	271	247.6	110.2
32	29.2	13.0	92	84.0	37.4	152	138.9	61.8	212	193.7	86.2	272	248.5	110.6
33	30.1	13.4	93	85.0	37.8	153	139.8	62.2	213	194.6	86.6	273	249.4	111.0
34	31.1	13.8	94	85.9	38.2	154	140.7	62.6	214	195.5	87.0	274	250.3	111.4
35	32.0	14.2	95	86.8	38.6	155	141.6	63.0	215	196.4	87.4	275	251.2	111.8
36	32.9	14.6	96	87.7	39.0	156	142.5	63.4	216	197.3	87.8	276	252.1	112.2
37	33.8	15.0	97	88.6	39.4	157	143.4	63.9	217	198.2	88.3	277	253.0	112.7
38	34.7	15.5	98	89.5	39.9	158	144.3	64.3	218	199.1	88.7	278	254.0	113.1
39	35.6	15.9	99	90.4	40.3	159	145.2	64.7	219	100.1	89.1	279	254.9	113.5
40	36.5	16.3	100	91.4	40.7	160	146.2	65.1	220	201.0	89.5	280	255.8	113.9
41	37.5	16.7	101	92.3	41.1	161	147.1	65.5	221	201.9	89.9	281	256.7	114.3
42	38.4	17.1	102	93.2	41.5	162	148.0	65.9	222	202.8	90.3	282	257.6	114.7
43	39.3	17.5	103	94.1	41.9	163	148.9	66.3	223	203.7	90.7	283	258.5	115.1
44	40.2	17.9	104	95.0	42.3	164	149.8	66.7	224	204.6	91.1	284	259.4	115.5
45	41.1	18.3	105	95.9	42.7	165	150.7	67.1	225	205.5	91.5	285	260.3	115.9
46	42.0	18.7	106	96.8	43.1	166	151.6	67.5	226	206.5	91.9	286	261.3	116.3
47	42.9	19.1	107	97.7	43.5	167	152.6	67.9	227	207.4	92.3	287	162.2	116.7
48	43.8	19.5	108	98.7	43.9	168	153.5	68.3	228	208.3	92.7	288	263.1	117.1
49	44.8	19.9	109	99.6	44.3	169	154.4	68.7	229	209.2	93.1	289	264.0	117.5
50	45.7	20.3	110	100.5	44.7	170	155.3	69.1	230	210.1	93.5	290	264.9	117.9
51	46.6	20.7	111	101.4	45.1	171	156.2	69.5	231	211.0	93.9	291	265.8	118.3
52	47.5	21.1	112	102.3	45.6	172	157.1	70.0	232	211.9	94.4	292	266.7	118.8
53	48.4	21.6	113	103.2	86.0	173	158.0	70.4	233	212.8	94.8	293	267.7	119.2
54	49.3	22.0	114	104.1	46.4	174	158.9	70.8	234	213.8	95.2	294	268.6	119.6
55	50.2	22.4	115	105.1	46.8	175	159.9	71.2	235	214.7	95.6	295	269.5	120.0
56	51.2	22.8	116	106.0	47.2	176	160.8	71.6	236	215.6	96.0	296	270.4	120.4
57	52.1	23.2	117	106.9	47.6	177	161.7	72.0	237	216.5	96.4	297	271.3	120.8
58	53.0	23.6	118	107.8	48.0	178	162.6	72.4	238	217.4	96.8	298	272.2	121.2
59	53.9	24.0	119	108.7	48.4	179	163.5	72.8	239	218.3	97.2	299	273.1	121.6
60	54.8	24.4	120	109.6	48.8	180	164.4	73.2	240	219.2	97.6	300	274.1	122.0
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

for 66 Degrees.

Difference of Latitude and Departure for 25 Degrees.

Dift.	Lat.	Dep.	Dift	Lat.	Dep.	Dift	Lat.	Dep.	Dift	Lat.	Dep.	Dift	Lat.	Dep.
1	00.9	00.4	61	55.3	25.8	121	109.7	51.1	181	164.0	76.5	241	218.4	101.8
2	01.8	00.8	62	56.2	26.2	122	110.6	51.6	182	164.9	76.9	242	219.3	102.3
3	02.7	01.3	63	57.1	26.6	123	111.5	52.0	183	165.9	77.3	243	220.2	102.7
4	03.6	01.7	64	58.0	27.0	124	112.4	52.4	184	166.8	77.8	244	221.1	103.1
5	04.5	02.1	65	58.9	27.5	125	113.3	52.8	185	167.7	78.2	245	222.0	103.5
6	05.4	02.5	66	59.8	27.9	126	114.2	53.2	186	168.6	78.6	246	222.9	104.0
7	06.3	03.0	67	60.7	28.3	127	115.1	53.7	187	169.5	79.0	247	223.9	104.4
8	07.3	03.4	68	61.6	28.7	128	116.0	54.1	188	170.4	79.4	248	224.8	104.8
9	08.2	03.8	69	62.5	29.2	129	116.9	54.5	189	171.3	79.9	249	225.7	105.2
10	09.1	04.2	70	63.4	29.6	130	117.8	54.9	190	172.2	80.3	250	226.6	105.7
11	10.0	04.6	71	64.3	30.0	131	118.7	55.4	191	173.1	80.7	251	227.5	106.1
12	10.9	05.0	72	65.3	30.4	132	119.6	55.8	192	174.0	81.1	252	228.4	106.5
13	11.8	05.5	73	66.2	30.8	133	120.5	56.2	193	174.9	81.6	253	229.3	106.9
14	12.7	05.9	74	67.1	31.3	134	121.4	56.6	194	175.8	82.0	254	230.2	107.3
15	13.6	06.3	75	68.0	31.7	135	122.4	57.1	195	176.7	82.4	255	231.1	107.8
16	14.5	06.8	76	68.9	32.1	136	123.3	57.5	196	177.6	82.8	256	232.0	108.2
17	15.4	07.2	77	69.8	32.5	137	124.2	57.9	197	178.5	83.3	257	232.9	108.6
18	16.3	07.6	78	70.7	33.0	138	125.1	58.3	198	179.4	83.7	258	233.8	109.0
19	17.2	08.0	79	71.6	33.4	139	126.0	58.7	199	180.4	84.1	259	234.7	109.5
20	18.1	08.5	80	72.5	33.8	140	126.9	59.2	200	181.3	84.5	260	235.6	109.9
21	19.0	08.9	81	73.4	34.2	141	127.8	59.6	201	182.2	84.9	261	236.5	110.3
22	19.9	09.3	82	74.3	34.7	142	128.7	60.0	202	183.1	85.4	262	237.5	110.7
23	20.8	09.7	83	75.2	35.1	143	129.6	60.4	203	184.0	85.8	263	238.4	111.1
24	21.8	10.1	84	76.1	35.5	144	130.5	60.9	204	184.9	86.2	264	239.3	111.6
25	22.7	10.6	85	77.0	35.9	145	131.4	61.3	205	185.8	86.6	265	240.2	112.0
26	23.6	11.0	86	77.9	36.3	146	132.3	61.7	206	186.7	87.1	266	241.1	112.4
27	24.5	11.4	87	78.8	36.8	147	133.2	62.1	207	187.6	87.5	267	242.0	112.8
28	25.4	11.8	88	79.8	37.2	148	134.1	62.5	208	188.5	87.9	268	242.9	113.3
29	26.3	12.3	89	80.7	37.6	149	135.0	63.0	209	189.4	88.3	269	243.8	113.7
30	27.2	12.7	90	81.6	38.0	150	135.9	63.4	210	190.3	88.7	270	244.7	114.1
31	28.1	13.1	91	82.5	38.5	151	136.9	63.8	211	191.2	89.2	271	245.6	114.5
32	29.0	13.5	92	83.4	38.9	152	137.8	64.2	212	192.1	89.6	272	246.5	114.9
33	29.9	13.9	93	84.3	39.3	153	138.7	64.7	213	193.0	90.0	273	247.4	115.4
34	30.8	14.4	94	85.2	39.7	154	139.6	65.1	214	193.9	90.4	274	248.3	115.8
35	31.7	14.8	95	86.1	40.1	155	140.5	65.5	215	194.9	90.9	275	249.2	116.2
36	32.6	15.2	96	87.0	40.6	156	141.4	65.9	216	195.8	91.3	276	250.1	116.6
37	33.5	15.6	97	87.9	41.0	157	142.3	66.3	217	196.7	91.7	277	251.0	117.1
38	34.4	16.1	98	88.8	41.4	158	143.2	66.8	218	197.6	92.1	278	252.0	117.5
39	35.3	16.5	99	89.7	41.8	159	144.1	67.2	219	198.5	92.5	279	252.9	117.9
40	36.3	16.9	100	90.6	42.3	160	145.0	67.6	220	199.4	93.0	280	253.8	118.3
41	37.2	17.3	101	91.5	42.7	161	145.9	68.0	221	200.3	93.4	281	254.7	118.8
42	38.1	17.7	102	92.4	43.1	162	146.8	68.5	222	201.2	93.8	282	255.6	119.2
43	39.0	18.2	103	93.3	43.5	163	147.7	68.9	223	202.1	94.2	283	256.5	119.6
44	39.9	18.6	104	94.3	44.0	164	148.6	69.3	224	203.0	94.7	284	257.4	120.0
45	40.8	19.0	105	95.2	44.4	165	149.5	69.7	225	203.9	95.1	285	258.3	120.4
46	41.7	19.4	106	96.1	44.8	166	150.4	70.2	226	204.8	95.5	286	259.2	120.9
47	42.6	19.9	107	97.0	45.2	167	151.4	70.6	227	205.7	95.9	287	260.1	121.3
48	43.5	20.3	108	97.9	45.6	168	152.3	71.0	228	206.6	96.4	288	261.0	121.7
49	44.4	20.7	109	98.8	46.1	169	153.2	71.4	229	207.5	96.8	289	261.9	122.1
50	45.3	21.1	110	99.7	46.5	170	154.1	71.8	230	208.4	97.2	290	262.8	122.6
51	46.2	21.6	111	100.6	46.9	171	155.0	72.3	231	209.4	97.6	291	263.7	123.0
52	47.1	22.0	112	101.5	47.3	172	155.9	72.7	232	210.3	98.0	292	264.6	123.4
53	48.0	22.4	113	102.4	47.8	173	156.8	73.1	233	211.2	98.5	293	265.5	123.8
54	48.9	22.8	114	103.3	48.2	174	157.7	73.5	234	212.1	98.9	294	266.5	124.2
55	49.8	23.2	115	104.2	48.6	175	158.6	74.0	235	213.0	99.3	295	267.4	124.7
56	50.8	23.7	116	105.1	49.0	176	159.5	74.4	236	213.9	99.7	296	268.3	125.1
57	51.7	24.1	117	106.0	49.4	177	160.4	74.8	237	214.8	100.2	297	269.2	125.5
58	52.7	24.5	118	106.9	49.9	178	161.3	75.2	238	215.7	100.6	298	270.1	125.6
59	53.5	24.9	119	107.8	50.3	179	162.2	75.6	239	216.6	101.0	290	271.0	126.4
60	54.4	25.4	120	108.8	50.7	180	163.1	76.1	240	217.5	101.4	300	271.9	126.8
Dift.	Dep.	Lat.	Dift	Dep	Lat.	Dift	Dep.	Lat.	Dift	Dep.	Lat.	Dift	Dep.	Lat.

For 65 Degrees.

Difference of Latitude and Departure for 26 Degrees.

Diſt.	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.
1	00.9	00.4	61	54.8	26.7	121	108.8	53.0	181	162.7	79.4	241	216.6	105.7
2	01.8	00.9	62	55.7	27.2	122	109.7	53.5	182	163.6	79.8	242	217.5	106.1
3	02.7	01.3	63	56.6	27.6	123	110.6	53.9	183	164.5	80.2	243	218.4	106.5
4	03.6	01.8	64	57.5	28.1	124	111.5	54.4	184	165.4	80.7	244	219.3	107.0
5	04.5	02.2	65	58.4	28.5	125	112.4	54.8	185	166.3	81.1	245	220.2	107.4
6	05.4	02.6	66	59.3	28.9	122	113.2	55.2	186	167.2	81.5	246	221.1	107.8
7	06.3	03.1	67	60.2	29.4	127	114.1	55.7	187	168.1	82.0	247	222.0	108.3
8	07.2	03.5	68	61.1	29.8	128	115.0	56.1	188	169.0	82.4	248	222.9	108.7
9	08.1	03.9	69	62.0	30.2	129	115.9	56.6	189	169.9	82.9	249	223.8	109.2
10	09.0	04.4	70	62.9	30.7	130	116.8	57.0	190	170.8	83.3	250	224.7	109.6
11	09.9	04.8	71	63.8	31.1	131	117.7	57.4	191	171.7	83.7	251	225.6	110.0
12	10.8	05.3	72	64.7	31.6	132	118.6	57.9	192	172.6	84.2	252	226.5	110.5
13	11.7	05.7	73	65.6	32.0	133	119.5	58.3	193	173.5	84.6	253	227.4	110.9
14	12.6	06.1	74	66.5	32.4	134	120.4	58.7	194	174.4	85.0	254	228.3	111.4
15	13.5	06.6	75	67.4	32.9	135	121.3	59.2	195	175.3	85.5	255	229.2	111.8
16	14.4	07.0	76	68.3	33.3	136	122.2	59.6	196	176.2	85.9	256	230.1	112.2
17	15.3	07.5	77	69.2	33.8	137	123.1	60.1	197	177.1	86.4	257	231.0	112.7
18	16.2	07.9	78	70.1	34.2	138	124.0	60.5	198	178.0	86.8	258	231.9	113.1
19	17.1	08.3	79	71.0	34.6	139	124.9	60.9	199	178.9	87.2	259	232.8	113.5
20	18.0	08.7	80	71.9	35.1	140	125.8	61.4	100	179.8	87.7	260	233.7	114.0
21	18.9	09.2	81	72.8	35.5	141	126.7	61.8	101	180.7	88.1	261	234.6	114.4
22	19.8	09.6	82	73.7	35.9	142	127.6	62.3	102	181.6	88.6	262	235.5	114.9
23	20.7	10.1	83	74.6	36.4	143	128.5	62.7	103	182.5	89.0	263	236.4	115.3
24	21.6	10.5	84	75.5	36.8	144	129.4	63.1	104	183.4	89.4	264	237.3	115.7
25	22.5	11.0	85	76.4	37.3	145	130.3	63.6	105	184.3	80.9	265	238.2	116.2
26	23.4	11.4	86	77.3	37.7	146	131.2	64.0	106	185.2	90.3	266	239.1	116.6
27	24.3	11.8	87	78.2	38.1	147	132.1	64.4	107	186.1	90.7	267	240.0	117.1
28	25.2	12.3	88	79.1	38.6	148	133.0	64.9	108	187.0	91.2	268	240.9	117.5
29	26.1	12.7	89	80.0	39.0	149	133.9	65.3	109	187.8	91.6	269	241.8	117.9
30	27.0	13.2	90	80.9	39.5	150	134.8	65.8	110	188.7	92.1	270	242.7	118.4
31	27.9	13.6	91	81.8	39.9	151	135.7	66.2	211	189.6	92.5	271	243.6	118.8
32	28.8	14.0	92	82.7	40.3	152	136.6	66.6	212	190.5	92.9	272	244.5	119.2
33	29.7	14.5	93	83.6	40.8	193	137.5	67.1	213	191.4	93.4	273	245.4	119.7
34	30.6	14.9	94	84.5	41.2	154	138.4	67.5	214	192.3	93.8	274	246.3	120.1
35	31.5	15.3	95	85.4	41.6	155	139.3	68.0	215	193.2	94.3	275	247.2	120.6
36	32.4	15.8	96	86.3	42.1	156	140.2	68.4	216	194.1	94.7	276	248.1	121.0
37	33.3	16.2	97	87.2	42.5	157	141.1	68.8	217	195.0	95.1	277	249.0	121.4
38	34.2	16.7	98	88.1	43.0	158	142.0	69.3	218	195.9	95.6	278	249.9	121.9
39	35.1	17.1	99	89.0	43.4	159	142.9	69.7	219	196.8	96.0	279	250.8	122.3
40	36.0	17.5	100	89.9	43.8	160	143.8	70.1	220	197.7	96.4	280	251.7	122.8
41	36.9	18.0	101	90.8	44.3	161	144.7	70.6	221	198.6	96.9	281	252.6	123.2
42	37.7	18.4	102	91.7	44.7	162	145.6	71.0	222	199.5	97.3	282	253.5	123.6
43	38.6	18.9	103	92.6	45.2	163	146.5	71.5	223	200.4	97.8	283	254.4	124.1
44	39.5	19.3	104	93.5	45.6	164	147.4	71.9	224	201.3	98.2	284	255.3	124.5
45	40.4	19.7	105	94.4	46.0	165	148.3	72.3	225	202.2	98.6	285	256.2	124.9
46	41.3	20.2	106	95.3	46.5	166	149.2	72.8	226	203.1	99.1	286	257.1	125.4
47	42.2	20.6	107	96.2	46.9	167	150.1	73.2	227	204.0	99.5	287	258.0	125.8
48	43.1	21.0	108	97.1	47.3	168	151.0	73.7	228	204.9	100.0	288	258.9	126.3
49	44.0	21.5	109	98.0	47.8	169	151.9	74.1	229	205.8	100.4	289	259.8	126.7
50	44.9	21.9	110	98.9	48.2	170	152.8	74.5	230	206.7	100.8	290	260.7	127.1
51	45.8	22.4	111	99.8	48.7	171	153.7	75.0	231	207.6	101.3	291	261.6	127.6
52	46.7	22.8	112	100.7	49.1	172	154.6	75.4	232	208.5	101.7	292	262.4	128.0
53	47.6	23.2	113	101.6	49.5	173	155.5	75.8	233	209.4	102.1	293	263.3	128.5
54	48.5	23.7	114	102.5	50.0	174	156.4	76.3	234	210.3	102.6	294	264.2	128.9
55	49.4	24.1	115	103.4	50.4	175	157.3	76.7	235	211.2	103.0	295	265.1	129.3
56	50.3	24.6	116	104.3	50.9	176	158.2	77.2	236	212.1	103.5	296	266.0	129.8
57	51.2	25.0	117	105.2	51.3	177	159.1	77.6	237	213.0	103.9	297	266.9	130.2
58	52.1	25.4	118	106.1	51.7	178	160.0	78.0	238	213.9	104.3	298	267.8	130.6
59	53.0	25.9	119	107.0	52.2	179	160.9	78.5	239	214.8	104.8	299	268.7	131.1
60	53.9	26.3	120	107.9	52.6	180	161.8	78.9	240	215.7	105.2	300	269.6	131.5
Diſt.	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.

for 64 Degrees.

Difference of Latitude and Departure for 19 Degrees.

Dist.	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.9	00.3	61	57.7	19.9	121	114.4	39.4	181	171.1	58.9	241	227.9	78.5
2	01.9	00.7	62	58.6	20.2	122	115.3	39.7	182	172.1	59.3	242	228.8	78.8
3	02.8	01.0	63	59.6	20.5	123	116.3	40.0	183	173.0	59.6	243	229.7	79.1
4	03.8	01.3	64	60.5	20.8	124	117.2	40.4	184	174.0	59.9	244	230.7	79.4
5	04.7	01.6	65	61.5	21.2	125	118.2	40.7	185	174.9	60.2	245	231.6	79.8
6	05.7	02.0	66	62.4	21.5	126	119.1	41.0	186	175.9	60.6	246	232.6	80.1
7	06.6	02.3	67	63.3	21.8	127	120.1	41.4	187	176.8	60.9	247	233.5	80.4
8	07.6	02.6	68	64.3	22.1	128	121.0	41.7	188	177.7	61.2	248	234.5	80.7
9	08.5	02.9	69	65.2	22.5	129	122.0	42.0	189	178.7	61.5	249	235.4	81.1
10	09.5	03.3	70	66.2	22.8	130	122.9	42.3	190	179.6	61.9	250	236.4	81.4
11	10.4	03.6	71	67.1	23.1	131	123.9	42.7	191	180.6	62.2	251	237.3	81.7
12	11.3	03.9	72	68.1	23.4	132	124.8	43.0	192	181.5	62.5	252	238.3	82.1
13	12.3	04.2	73	69.0	23.8	133	125.7	43.3	193	182.5	62.8	253	239.2	82.4
14	13.2	04.6	74	70.0	24.1	134	126.7	43.6	194	183.4	63.2	254	240.1	82.7
15	14.2	04.9	75	70.9	24.4	135	127.6	44.0	195	184.4	63.5	255	241.1	83.0
16	15.1	05.2	76	71.9	24.7	136	128.6	44.3	196	185.3	63.8	256	242.0	83.4
17	16.1	05.5	77	72.8	25.1	137	129.5	44.6	197	186.3	64.1	257	243.0	83.7
18	17.0	05.9	78	73.7	25.4	138	130.5	44.9	198	187.2	64.5	258	243.9	84.0
19	18.0	06.2	79	74.7	25.7	139	131.4	45.3	199	188.1	64.8	259	244.9	84.3
20	18.9	26.5	80	75.6	26.0	140	132.4	45.6	200	189.1	65.1	260	245.8	84.7
21	19.9	06.8	81	76.6	26.4	141	133.3	45.9	201	190.0	65.4	261	246.8	85.0
22	20.8	07.2	82	77.5	26.7	142	134.3	46.2	202	191.0	65.8	262	247.7	85.3
23	21.7	07.5	83	78.5	27.0	143	135.2	46.6	203	191.9	66.1	263	248.7	85.6
24	22.7	07.8	84	79.4	27.4	144	136.1	46.9	204	192.9	66.4	264	249.6	86.0
25	23.6	08.1	85	80.4	7.7	145	137.1	47.2	205	193.8	66.7	265	250.5	86.3
26	24.6	08.5	86	81.3	28.0	146	138.0	47.5	206	194.8	67.1	266	251.5	86.6
27	25.5	08.8	87	82.3	28.3	147	139.0	47.9	207	195.7	67.4	267	252.4	86.9
28	26.5	09.1	88	83.2	28.7	148	139.9	48.2	208	196.7	67.7	268	253.4	87.3
29	27.4	09.4	89	84.1	29.0	149	140.9	48.5	209	197.6	68.1	269	254.3	87.6
30	28.4	09.8	90	85.1	29.3	150	141.8	48.8	210	198.5	68.4	270	255.3	87.9
31	29.3	10.1	91	86.0	29.6	151	142.8	49.2	211	199.5	68.7	271	256.2	88.2
32	30.3	10.4	92	87.0	30.0	152	143.7	49.5	212	200.4	69.0	272	257.2	88.6
33	31.2	10.7	93	87.9	30.3	153	144.7	49.8	213	201.4	69.4	273	258.1	88.9
34	32.1	11.1	94	88.9	30.6	154	145.6	50.1	214	202.3	69.7	274	259.1	89.2
35	33.1	11.4	95	89.8	30.9	155	146.5	50.5	215	203.3	70.0	275	260.0	89.5
36	34.0	11.7	96	90.8	31.3	156	147.5	50.8	216	204.2	70.3	276	260.9	89.9
37	35.0	12.0	97	91.7	31.6	157	148.4	51.1	217	205.2	70.7	277	261.9	90.2
38	35.9	12.4	98	92.7	31.9	158	149.4	51.4	218	206.1	71.0	278	262.8	90.5
39	36.9	12.7	99	93.6	32.2	159	150.3	51.8	219	207.1	71.3	279	263.8	90.8
40	37.8	13.0	100	94.5	32.6	160	151.3	52.1	220	208.0	71.6	280	264.7	91.2
41	38.8	13.3	101	95.5	32.9	161	152.2	52.4	221	208.9	72.0	281	265.7	91.5
42	39.7	13.7	102	96.4	33.2	162	153.2	52.7	222	209.9	72.3	282	266.6	91.8
43	40.7	14.0	103	97.4	33.5	163	154.1	53.1	223	210.8	72.6	283	267.6	92.1
44	41.6	14.3	104	98.3	33.9	164	155.1	53.4	224	211.8	72.9	284	268.5	92.5
45	42.5	14.7	105	99.3	34.2	165	156.0	53.7	225	212.7	73.3	285	269.5	92.8
46	43.5	15.0	106	100.2	34.5	166	157.9	54.0	226	213.7	73.6	286	270.4	93.1
47	44.4	15.3	107	101.2	34.8	167	158.9	54.4	227	214.6	73.9	287	271.3	93.4
48	45.4	15.6	108	102.1	35.2	168	159.8	54.7	228	215.6	74.2	288	272.3	93.8
49	46.3	16.0	109	103.1	35.5	169	160.8	55.0	229	216.5	74.6	289	273.2	94.1
50	47.3	16.3	110	104.0	35.8	170	161.7	55.4	230	217.5	74.9	290	274.2	94.4
51	48.2	16.6	111	104.9	36.1	171	161.7	55.7	231	218.4	35.2	291	275.1	94.7
52	49.2	16.9	112	105.9	36.5	172	162.6	56.0	232	219.3	75.5	292	276.1	95.1
53	50.1	17.3	113	106.8	36.8	173	163.6	56.3	233	220.3	75.9	293	277.0	95.4
54	51.1	17.6	114	107.8	37.1	174	164.5	56.7	234	221.2	76.2	294	278.0	95.7
95	52.0	17.9	115	108.7	37.4	175	165.5	57.0	235	222.2	76.5	295	278.9	96.1
56	52.9	18.2	116	109.7	37.8	176	166.4	57.3	236	223.1	76.8	296	279.9	96.4
57	53.9	18.6	117	110.6	38.1	177	167.3	57.6	237	224.1	77.2	297	280.8	96.7
58	54.8	18.9	118	111.6	38.4	178	168.3	58.0	238	225.0	77.5	298	281.7	97.0
59	55.8	19.2	119	112.5	38.7	179	169.2	58.3	239	226.0	77.8	299	282.7	97.4
60	56.7	19.5	120	113.5	39.1	180	170.2	58.6	240	226.9	78.1	300	283.6	97.7
Dist.	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep	Lat.	Dist	Dep.	Lat.

for 71 Degrees.

Difference of Latitude and Departure for 20 Degrees.

Diſt.	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep
1	00.9	00.3	61	57.3	20.9	121	113.7	41.4	181	179.1	61.9	241	226.5	82.4
2	01.9	00.7	62	58.3	21.2	122	114.6	41.7	182	170.0	62.2	242	227.4	82.8
3	02.8	01.0	63	59.2	21.5	123	115.6	42.1	183	171.0	62.6	243	228.3	83.1
4	03.8	01.4	64	60.1	21.9	124	116.5	42.4	184	172.9	62.9	244	229.3	83.4
5	04.7	01.7	65	61.1	22.2	125	117.5	42.8	185	173.8	63.3	245	230.2	83.8
6	05.6	02.1	66	62.0	22.6	126	118.4	43.1	186	174.8	63.6	246	231.2	84.1
7	06.6	02.4	67	63.0	22.9	127	119.3	43.4	187	175.7	64.0	247	232.1	84.5
8	07.5	02.7	68	63.9	23.3	128	120.3	43.8	188	176.7	64.3	248	233.0	84.8
9	08.5	03.1	69	64.8	23.6	129	121.2	44.1	189	177.6	64.6	249	234.0	85.2
10	09.4	03.4	70	65.8	23.9	130	122.2	44.5	190	178.5	65.0	250	234.9	85.5
11	10.3	03.8	71	66.7	24.3	131	123.1	44.8	191	179.5	65.3	251	235.9	85.8
12	11.3	04.1	72	67.7	24.6	132	124.0	45.1	192	180.4	65.7	252	236.8	86.2
13	12.2	04.4	73	68.6	25.0	133	125.0	45.5	193	181.4	66.0	253	237.7	86.5
14	13.2	04.8	74	69.5	25.3	134	125.9	45.8	194	182.3	66.3	254	238.7	86.9
15	14.1	05.1	75	70.5	25.7	135	126.9	46.2	195	183.2	66.7	255	239.6	87.2
16	15.0	05.5	76	71.4	26.0	136	127.8	46.5	196	184.2	67.0	256	240.6	87.6
17	16.0	05.8	77	72.4	26.3	137	128.7	46.9	197	185.1	67.4	257	241.5	87.9
18	16.9	06.2	78	73.3	26.7	138	129.7	47.2	198	186.1	67.7	258	242.4	88.2
19	17.9	06.5	79	74.2	27.0	139	130.6	47.5	199	187.0	68.1	259	243.4	88.6
20	18.8	06.8	80	75.2	27.4	140	131.6	47.9	200	187.9	68.4	260	244.3	88.9
21	19.7	07.2	81	76.1	27.7	141	132.5	48.2	201	188.9	68.7	261	245.3	89.3
22	20.7	07.5	82	77.1	28.0	142	133.4	48.6	202	189.8	69.1	262	246.2	89.6
23	21.6	07.9	83	78.0	28.4	143	134.4	48.9	203	190.8	69.4	263	247.1	89.9
24	22.6	08.2	84	78.9	28.7	144	135.3	49.2	204	191.7	69.8	264	248.1	90.3
25	23.5	08.6	85	79.9	29.1	145	136.3	49.6	205	192.6	70.1	265	249.0	90.6
26	24.4	08.9	86	80.8	29.4	146	137.2	49.9	206	193.6	70.5	266	250.0	91.0
27	25.4	09.2	87	81.8	29.8	147	138.1	50.3	207	194.5	70.8	267	250.9	91.3
28	26.3	09.6	88	82.7	30.1	148	139.1	50.6	208	195.5	71.1	268	251.8	91.7
29	27.3	09.9	89	83.6	30.4	149	140.0	51.0	209	196.4	71.5	269	252.8	92.0
30	28.2	10.3	90	84.6	30.8	150	141.0	51.3	210	197.3	71.8	270	253.7	92.3
31	29.1	10.6	91	85.5	31.1	151	141.9	51.6	211	198.3	72.2	271	254.7	92.7
32	30.1	10.9	92	86.5	31.5	152	142.8	52.0	212	199.2	72.5	272	255.6	93.0
33	31.0	11.3	93	87.4	31.8	153	143.8	52.3	213	200.2	72.8	273	256.5	93.4
34	31.9	11.6	94	88.3	32.1	154	144.7	52.7	214	201.1	73.2	274	257.5	93.7
35	32.9	12.0	95	89.3	32.5	155	145.7	53.0	215	202.0	73.5	275	258.4	94.1
36	33.8	12.3	96	90.2	32.8	156	146.6	53.4	216	203.0	73.9	276	259.4	94.4
37	34.8	12.7	97	91.2	33.2	157	147.5	53.7	217	203.9	74.2	277	260.3	94.7
38	35.7	13.0	98	92.1	33.5	158	148.5	54.0	218	204.9	74.6	278	261.2	95.1
39	36.6	13.3	99	93.0	33.9	159	149.4	54.4	219	205.8	74.9	279	262.2	95.4
40	37.6	13.7	100	94.0	34.2	160	150.4	54.7	220	206.7	75.2	280	263.1	95.8
41	38.5	14.0	101	94.9	34.5	161	151.3	55.1	221	207.7	75.6	281	264.1	96.1
42	39.5	14.4	102	95.8	34.9	162	152.2	55.4	222	208.6	75.9	282	265.0	96.4
43	40.4	14.7	103	96.8	35.2	163	153.2	55.7	223	209.6	76.3	283	265.9	96.8
44	41.3	15.0	104	97.7	35.6	164	154.1	56.1	224	210.5	76.6	284	266.9	97.1
45	42.3	15.4	105	98.7	35.9	165	155.1	56.4	225	211.4	77.0	285	267.8	97.5
46	43.2	15.7	106	99.6	36.3	166	156.0	56.8	226	212.4	77.3	286	268.8	97.8
47	44.2	16.1	107	100.5	36.6	167	156.9	57.1	227	213.3	77.6	287	269.7	98.2
48	45.1	16.4	108	101.5	36.9	168	157.9	57.5	228	214.3	78.0	288	270.6	98.5
49	46.0	16.8	109	102.4	37.3	169	158.8	57.8	229	215.2	78.3	289	271.6	98.8
50	47.0	17.1	110	103.4	37.6	170	159.7	58.1	230	216.1	78.7	290	272.5	99.2
51	47.9	17.4	111	104.3	38.0	171	160.7	58.5	231	217.1	79.0	291	273.5	99.5
52	48.9	17.8	112	105.2	38.3	172	161.6	58.8	232	218.0	79.3	292	274.4	99.9
53	49.8	18.1	113	106.2	38.6	173	162.6	59.2	233	219.0	79.7	293	275.3	100.2
54	50.7	18.5	114	107.1	39.0	174	163.5	59.5	234	219.9	80.0	294	276.3	100.5
55	51.7	18.8	115	108.1	39.3	175	164.4	59.9	235	220.8	80.4	295	277.2	100.9
56	52.6	19.2	116	109.0	39.7	176	165.4	60.2	236	221.8	80.7	296	278.2	101.1
57	53.6	19.5	117	109.9	40.0	177	166.3	60.5	237	222.7	81.1	297	279.1	101.6
58	54.5	19.8	118	110.9	40.4	178	167.3	60.9	238	223.6	81.4	298	280.0	101.9
59	55.4	20.2	119	111.8	40.7	179	168.2	61.2	239	224.6	81.7	299	281.0	102.3
60	56.4	20.5	120	112.8	41.0	180	169.1	61.6	240	225.5	82.1	300	281.9	102.6
Diſt.	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.

for 70 Degrees.

Difference of Latitude and Departure for 21 Degrees.

Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.
1	00.9	00.4	61	56.9	21.9	121	113.0	43.4	181	169.0	64.9	241	225.0	86.4
2	01.9	00.7	62	57.9	22.2	122	113.9	43.7	182	169.9	65.2	242	225.9	86.7
3	02.8	01.1	63	58.8	22.6	123	114.9	44.1	183	170.9	65.6	243	226.9	87.1
4	03.7	01.4	64	59.7	22.9	124	115.8	44.4	184	171.8	65.9	244	227.8	87.4
5	04.7	01.8	65	60.7	23.3	125	116.7	44.8	185	172.7	66.3	245	228.7	87.8
6	05.6	02.2	66	61.6	23.7	126	117.7	45.2	186	173.7	66.7	246	229.7	88.2
7	06.5	02.5	67	62.5	24.0	127	118.6	45.5	187	174.6	67.0	247	230.6	88.5
8	07.5	02.9	68	63.5	24.4	128	119.5	45.9	188	175.5	67.4	248	231.5	88.9
9	08.4	03.2	69	64.4	24.7	129	120.5	46.2	189	176.5	67.7	249	232.5	89.2
10	09.3	03.6	70	65.3	25.1	130	121.4	46.6	190	177.4	68.1	250	233.4	89.6
11	10.3	03.9	71	66.3	25.4	131	122.3	47.0	191	178.3	68.5	251	234.3	90.0
12	11.2	04.3	72	67.2	25.8	132	123.3	47.3	192	179.3	68.8	252	235.3	90.3
13	12.1	04.6	73	68.1	26.2	133	124.2	47.7	193	180.2	69.2	253	236.2	90.7
14	13.1	05.0	74	69.1	26.5	134	125.1	48.0	194	181.1	69.5	254	237.1	91.0
15	14.0	05.4	75	70.0	26.9	135	126.1	48.4	195	182.1	69.9	255	238.1	91.4
16	14.9	05.7	76	70.9	26.2	136	127.0	48.7	196	183.0	70.2	256	239.0	91.8
17	15.9	06.1	77	71.9	27.6	137	127.9	49.1	197	183.9	70.6	257	239.9	92.1
18	16.8	06.5	78	72.8	28.0	138	128.9	49.5	198	184.9	71.0	258	240.9	92.5
19	17.7	06.8	79	73.7	28.3	139	129.8	49.8	199	185.8	71.3	259	241.8	92.8
20	18.7	07.2	80	74.7	28.7	140	130.7	50.2	200	186.7	71.7	260	242.7	93.2
21	19.6	07.5	81	75.6	29.0	141	131.7	50.5	201	187.6	72.0	261	243.7	93.5
22	20.5	07.9	82	76.5	29.4	142	132.6	50.9	202	188.6	72.4	262	244.6	93.9
23	21.5	08.2	83	77.5	29.7	143	133.5	51.3	203	189.5	72.8	263	245.5	94.2
24	22.4	08.6	84	78.4	30.1	144	134.5	51.6	204	190.4	73.1	264	246.5	94.6
25	23.3	09.0	85	79.3	30.5	145	135.4	52.0	205	191.4	73.5	265	247.4	95.0
26	24.3	09.3	86	80.3	30.8	146	136.3	52.3	206	192.3	73.8	266	248.3	95.3
27	25.2	09.7	87	81.2	31.2	147	137.3	52.7	207	193.2	74.2	267	249.3	95.7
28	26.1	10.0	88	82.1	31.5	148	138.2	53.0	208	194.2	74.5	268	250.2	96.1
29	27.1	10.4	89	83.1	31.9	149	139.1	53.4	209	195.1	74.9	269	251.1	96.4
30	28.0	10.8	90	84.0	32.3	150	140.1	53.8	210	196.0	75.3	270	252.1	96.8
31	28.9	11.1	91	84.9	32.6	151	141.0	54.1	211	197.0	75.6	271	253.0	97.1
32	29.9	11.5	92	85.9	33.0	152	141.9	54.5	212	197.9	76.0	272	253.9	97.5
33	30.8	11.8	93	86.8	33.3	153	142.9	54.8	213	198.8	76.3	273	254.9	97.8
34	31.7	12.2	94	87.7	33.7	154	143.8	55.2	214	199.8	76.7	274	255.8	98.2
35	32.7	12.5	95	88.7	34.0	155	144.7	55.6	215	200.7	77.1	275	256.7	98.6
36	33.6	12.9	96	89.6	34.4	156	145.7	55.9	216	201.6	77.3	276	257.7	98.9
37	34.5	13.3	97	90.5	34.8	157	146.6	56.3	217	202.6	77.8	277	258.6	99.3
38	35.5	13.6	98	91.5	35.1	158	147.5	56.6	218	203.5	78.1	278	259.5	99.6
39	36.4	14.0	99	92.4	35.5	159	148.5	57.0	219	204.4	78.5	279	260.5	100.0
40	37.3	14.3	100	93.4	35.8	160	149.4	57.3	220	205.4	78.8	280	261.4	100.4
41	38.3	14.7	101	94.3	36.2	161	150.3	57.7	221	206.3	79.2	281	262.3	100.7
42	39.2	15.1	102	95.3	36.6	162	151.3	58.1	222	207.2	79.6	282	263.3	101.1
43	40.1	15.4	103	96.2	36.9	163	152.2	58.4	223	208.2	79.9	283	264.2	101.4
44	41.1	15.8	104	97.1	37.3	164	153.1	58.8	224	209.1	80.3	284	265.1	101.8
45	42.0	16.1	105	98.1	37.6	165	154.1	59.1	225	210.0	80.6	285	266.1	102.1
46	42.9	16.5	106	99.0	38.0	166	155.0	59.5	226	211.0	81.0	285	267.0	102.5
47	43.9	16.8	107	99.9	38.3	167	155.9	59.9	227	211.9	81.4	287	267.9	102.9
48	44.8	17.2	108	100.9	38.7	168	156.9	60.2	228	212.8	81.7	288	268.9	103.2
49	45.7	17.6	109	101.8	39.1	169	157.8	60.6	229	213.8	82.1	289	269.8	103.6
50	46.7	17.9	110	102.7	39.4	170	158.7	60.9	230	214.7	82.4	290	270.7	103.9
51	47.6	18.3	111	103.7	39.8	171	159.7	61.3	231	215.6	82.8	291	271.7	104.3
52	48.5	18.6	112	104.6	40.1	172	160.6	61.6	232	216.6	83.1	292	272.6	104.7
53	49.5	19.0	113	105.5	40.5	173	161.5	62.0	233	217.5	83.5	293	273.5	105.0
54	50.4	19.4	114	106.5	40.9	174	162.5	62.4	234	218.4	83.9	294	274.5	105.4
55	51.3	19.7	115	107.4	41.2	175	163.4	62.7	235	219.4	84.2	295	275.4	105.7
56	52.3	20.1	116	108.3	41.6	176	164.3	63.1	236	220.3	84.6	296	276.3	106.1
57	53.2	20.4	117	109.3	41.9	177	165.3	63.4	237	221.2	84.9	297	277.3	106.4
58	54.1	20.8	118	110.2	42.3	178	166.2	63.8	238	222.2	85.3	298	278.2	106.8
59	55.1	21.1	119	111.1	42.6	179	167.1	64.2	239	223.1	85.7	299	279.1	107.2
60	56.0	21.5	120	112.1	43.0	180	168.1	64.5	240	224.1	86.0	300	280.1	107.5
Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.

for 69 Degrees.

Difference of Latitude and Departure for 22 Degrees.

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	00.9	00.7	61	56.6	22.9	121	112.2	45.3	181	167.8	67.8	241	223.5	90,3
2	01.9	00.7	62	57.5	23.2	122	113.1	45.7	182	168.8	68.2	242	224.4	90,7
3	02.8	01.1	63	58.4	23.6	123	114.0	46.1	183	169.7	68.6	243	225.3	91,0
4	03.7	01.5	64	59.3	24.0	124	115.0	46.5	184	170.6	68.9	244	226.2	91,4
5	04.6	01.9	65	60.3	24.3	125	115.9	46.8	185	171.5	69.3	245	227.2	91,8
6	05.6	02.2	66	61.2	24.7	126	116.8	47.2	186	172.5	69.7	246	228.1	92,2
7	06.5	02.6	67	62.1	25.1	127	117.8	47.6	187	173.4	70.1	247	229.0	92,5
8	07.4	03.0	68	63.0	25.5	128	118.7	47.9	188	174.3	70.4	248	229.9	92,9
9	08.3	03.4	69	64.0	25.8	129	119.6	48.3	189	175.2	70.8	249	230.9	93.3
10	09.3	03.7	70	64.9	26.2	130	120.5	48.7	190	176.2	71.2	250	231.8	93.7
11	10.2	04.1	71	65.8	26.6	131	121.5	49.1	191	177.1	71.5	251	232.7	94,0
12	11.1	04.5	72	66.8	27.0	132	122.4	49.4	192	178.0	71.9	252	233.7	94,4
13	12.1	04.9	73	67.7	27.3	133	123.3	49.8	193	178.9	72.3	253	234.6	94,8
14	13.0	05.2	74	68.6	27.7	134	124.2	50.2	194	179.8	72.7	254	235.5	95,2
15	13.9	05.6	75	69.5	28.1	135	125.2	50.6	195	180.8	73.0	255	236.4	95.5
16	14.8	06.0	76	70.5	28.5	136	126.1	50.9	196	181.7	73.4	256	237.4	95,9
17	15.8	06.4	77	71.4	28.8	137	127.0	51.3	197	182.7	73.8	257	238.3	96,3
18	16.7	06.7	78	72.3	29.2	138	128.0	51.7	198	183.6	74.2	258	239.2	96,6
19	17.6	07.1	79	73.2	29.6	139	128.9	52.1	199	184.5	74.5	259	240.1	97,0
20	18.5	07.5	80	74.2	30.0	140	129.8	52.4	200	185.4	74.9	260	241.1	97,4
21	19.5	07.9	81	75.1	30.3	141	130.7	52.8	201	186.4	75.3	261	242.0	97,8
22	20.4	08.2	82	76.0	30.7	142	131.7	53.2	202	187.3	75.7	262	242.9	98,1
23	21.3	08.6	83	77.0	31.1	143	132.6	53.6	203	188.2	76.0	263	243.9	98,5
24	22.3	09.0	84	77.9	31.5	144	133.5	53.9	204	189.1	76.4	264	244.8	98,9
25	23.2	09.4	85	78.8	31.8	145	134.4	54.3	205	190.1	76.8	265	245.7	99,3
26	24.1	09.7	86	79.7	32.2	146	135.4	54.7	206	191.0	77.2	266	246.6	99,6
27	25.0	10.1	87	80.7	32.6	147	136.3	55.1	207	191.9	77.5	267	247.6	100,0
28	26.0	10.5	88	81.6	33.0	148	137.2	55.4	208	192.9	77.9	268	248.5	100,4
29	26.9	10.9	89	82.5	33.3	149	138.2	55.8	209	193.8	78.3	269	249.4	100,8
30	27.8	11.2	90	83.4	33.7	150	139.1	56.2	210	194.7	78.7	270	250.3	101,1
31	28.7	11.6	91	84.4	34.1	151	140.0	56.6	211	195.6	79.0	271	251.3	101,5
32	29.7	12.0	92	85.3	34.5	152	140.9	56.9	212	196.6	79.4	272	252.2	101,9
33	30.6	12.4	93	86.2	34.8	153	141.9	57.3	213	197.5	79.8	273	253.1	102,3
34	31.5	12.7	94	87.2	35.2	154	142.8	57.7	214	198.4	80.2	274	254.1	102,6
35	32.5	13.1	95	88.1	35.6	155	143.7	58.1	215	199.3	80.5	275	255.0	103,0
36	33.4	13.5	96	89.0	36.0	156	144.6	58.4	216	200.3	80.9	276	255.9	103,4
37	34.3	13.9	97	89.9	36.3	157	145.6	58.8	217	201.2	81.3	277	256.8	103,8
38	35.2	14.2	98	90.9	36.7	158	146.5	59.2	218	202.1	81.7	278	257.8	104.1
39	36.2	14.6	99	91.8	37.1	159	147.4	59.6	219	203.1	82.0	279	258.7	104,5
40	37.1	15.0	100	92.7	37.5	160	148.4	59.9	220	204.0	82.4	280	259.6	104.9
41	38.0	15.4	101	93.6	37.8	161	149.3	60.3	221	204.9	82.8	281	260.5	105.3
42	38.9	15.7	102	94.6	38.2	162	150.2	60.7	222	205.8	83.2	282	261.5	105.6
43	39.9	16.1	103	95.5	38.6	163	151.1	61.1	223	206.7	83.5	283	262.4	106.0
44	40.8	16.5	104	96.4	39.0	164	152.1	61.4	224	207.7	83.9	284	263.3	106.4
45	41.7	16.9	105	97.4	39.3	165	153.0	61.8	225	208.6	84.3	285	264.3	106.8
46	42.7	17.2	106	98.3	39.7	166	153.9	62.2	226	209.5	84.7	286	265.2	107.1
47	43.6	17.6	107	99.2	40.1	167	154.8	62.6	227	210.5	85.0	287	266.1	107.5
48	44.5	18.0	108	100.1	40.5	168	155.8	62.9	228	211.4	85.4	288	267.0	107.9
49	45.4	18.4	109	101.1	40.8	169	156.7	63.3	229	212.3	85.8	289	268.0	108.3
50	46.4	18.7	110	102.0	41.2	170	157.6	63.7	230	213.3	86.2	290	268.9	108.6
51	47.3	19.1	111	102.9	41.6	171	158.6	64.1	231	214.2	86.5	291	269.8	109.0
52	48.2	19.5	112	103.8	42.0	172	159.5	64.4	232	215.1	86.9	292	270.7	109.4
53	49.1	19.9	113	104.8	42.3	173	160.4	64.8	233	216.0	87.3	293	271.7	109.8
54	50.1	20.2	114	105.7	42.7	174	161.3	65.2	234	217.0	87.7	294	272.6	110.1
95	51.0	20.6	115	106.6	43.1	175	162.3	65.6	235	217.9	88.0	295	273.5	110.5
56	51.9	21.0	116	107.6	43.5	176	163.2	65.9	236	218.8	88.4	296	274.5	110.9
57	52.9	21.4	117	108.5	43.8	177	164.1	66.3	237	219.7	88.8	297	275.4	111.3
58	53.8	21.7	118	109.4	44.2	178	165.0	66.7	238	220.7	89.2	298	276.3	111.6
59	54.7	22.1	119	110.3	44.6	179	166.0	67.1	239	221.6	89.5	299	277.2	112.0
60	55.6	22.5	120	111.3	45.0	180	166.9	67.4	240	222.5	89.9	300	278.2	112.4
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

for 68 Degrees.

Difference of Latitude and Departure for 23 Degrees.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.9	00.4	61	56.1	23.8	121	111.4	47.3	181	166.6	70.7	241	221.8	94.2
2	01.8	00.8	62	57.1	24.2	122	112.3	47.7	182	167.5	71.1	242	222.8	94.5
3	02.8	01.2	63	58.0	24.6	123	113.2	48.1	183	168.5	71.5	243	223.7	94.9
4	03.7	01.6	64	58.9	25.0	124	114.1	48.4	184	169.4	71.9	244	224.6	95.3
5	04.6	02.0	65	59.8	25.4	125	115.1	48.8	185	170.3	72.3	245	223.5	95.7
6	05.5	02.3	66	60.8	25.8	126	116.0	49.2	186	171.2	72.7	246	226.4	96.1
7	06.4	02.7	67	61.7	26.2	127	116.9	49.6	187	172.2	73.1	247	227.4	96.5
8	07.4	03.1	68	62.6	26.6	128	117.8	50.0	188	173.1	73.5	248	228.3	96.9
9	08.3	03.5	69	63.5	27.0	129	118.7	50.4	189	174.0	73.8	249	229.2	97.3
10	09.2	03.9	70	64.4	27.3	130	119.7	50.8	190	174.9	74.2	250	230.1	97.7
11	10.1	08.3	71	65.4	27.7	131	120.6	51.2	191	175.8	74.6	251	231.0	98.1
12	11.0	04.7	72	66.3	28.1	132	121.5	51.6	192	176.7	75.0	252	232.0	98.5
13	12.0	05.1	73	67.2	28.5	133	122.4	52.0	193	177.7	75.4	253	232.9	98.8
14	12.9	05.5	74	68.1	28.9	134	123.3	52.4	194	178.6	75.8	254	233.8	99.2
15	13.8	05.9	75	69.0	29.3	135	124.3	52.7	195	179.5	76.2	255	234.7	99.6
16	14.7	06.3	76	70.0	29.7	136	125.2	53.1	196	180.4	76.6	256	235.6	100.0
17	15.6	06.6	77	70.9	30.1	137	126.1	53.5	197	181.3	77.0	257	236.6	100.3
18	16.6	07.0	78	71.8	30.5	138	127.0	53.9	198	182.3	77.4	258	237.5	100.8
19	17.5	07.4	79	72.7	30.9	139	127.9	54.3	199	183.2	77.7	259	238.4	101.2
20	18.4	07.8	80	73.6	31.3	140	128.9	54.7	200	184.1	78.1	260	239.3	101.6
21	19.3	08.2	81	74.6	31.6	141	129.8	55.1	201	185.0	78.5	261	240.2	102.0
22	20.3	08.6	82	75.5	32.0	142	130.7	55.5	202	185.9	78.9	262	241.2	102.4
23	21.2	09.0	83	76.4	32.4	143	131.6	55.9	203	186.9	79.3	263	242.1	102.8
24	22.1	09.4	84	77.3	32.8	144	132.6	56.3	204	187.8	79.7	264	243.0	103.1
25	23.0	09.8	85	78.2	33.2	145	133.5	56.7	205	188.7	80.1	265	243.9	103.5
26	23.9	10.2	86	79.2	33.6	146	134.4	57.0	206	189.6	80.5	266	244.9	103.9
27	24.9	10.5	87	80.1	34.0	147	135.3	57.4	207	190.5	80.9	267	245.8	104.3
28	25.8	10.9	88	81.0	34.4	148	136.2	57.8	208	191.5	81.3	268	246.7	104.7
29	26.7	11.3	89	81.9	34.8	149	137.2	58.2	209	192.4	81.7	269	247.6	105.1
30	27.6	11.7	90	82.8	35.2	150	138.1	58.6	210	193.3	82.0	270	248.5	105.5
31	28.5	12.1	91	83.8	35.6	151	139.0	59.0	211	194.2	82.4	271	249.5	105.9
32	29.5	12.5	92	84.7	35.9	152	139.9	59.4	212	195.1	82.8	272	250.4	106.3
33	30.4	12.9	93	85.6	36.3	153	140.8	59.8	213	196.1	83.2	273	251.3	106.7
34	31.3	13.3	94	86.5	36.7	154	141.8	60.2	214	197.0	83.6	274	252.2	107.1
35	32.2	13.7	95	87.4	37.1	155	142.7	60.6	215	197.9	84.0	275	253.1	107.4
36	33.1	14.1	96	88.4	37.5	156	143.6	60.9	216	198.8	84.4	276	254.1	107.8
37	34.1	14.5	97	89.3	37.9	157	144.5	61.3	217	199.7	84.8	277	255.0	108.2
38	35.0	14.8	98	90.2	38.3	158	145.4	61.7	218	200.7	85.2	278	255.9	108.6
39	35.9	15.2	99	91.1	38.7	159	146.4	62.1	219	201.6	85.6	279	256.8	109.0
40	36.8	15.6	100	92.0	39.1	160	147.3	62.5	220	202.5	86.0	280	257.7	109.4
41	37.7	16.0	101	93.0	39.5	161	148.2	62.9	221	203.4	86.3	281	258.7	109.8
42	38.7	16.4	102	93.9	39.9	162	149.1	63.3	222	204.4	86.7	282	259.6	110.2
43	39.6	16.8	103	94.8	40.2	163	150.0	63.7	223	205.3	87.1	283	260.5	110.6
44	40.5	17.2	104	95.7	40.6	164	151.9	64.1	224	206.2	87.5	284	261.4	111.0
45	41.4	17.6	105	96.7	41.0	165	151.9	64.5	225	207.1	87.9	285	262.3	111.3
46	42.3	18.0	106	97.6	41.4	166	152.8	64.9	226	208.0	88.3	286	263.3	111.7
47	43.3	18.4	107	98.5	41.8	167	153.7	65.2	227	209.0	88.7	287	264.2	112.1
48	44.2	18.8	108	99.4	42.2	168	154.6	65.6	228	209.9	89.1	288	265.1	112.5
49	45.1	19.1	109	100.3	42.6	169	155.6	66.0	229	210.8	89.5	289	266.0	112.9
50	46.0	19.5	110	101.3	43.0	170	156.5	66.4	230	211.7	89.9	290	266.9	113.3
51	46.9	19.9	111	102.2	43.4	171	157.4	66.8	231	212.6	90.3	291	267.9	113.7
52	47.9	20.3	112	103.1	43.8	172	158.3	67.2	232	213.6	90.6	292	268.8	114.1
53	48.8	20.7	113	104.0	44.1	173	159.2	67.6	233	214.5	91.0	293	269.7	114.5
54	49.7	21.1	114	104.9	44.5	174	160.2	68.0	234	215.4	91.4	294	270.6	114.9
55	50.6	21.5	115	105.9	44.9	175	161.1	68.4	235	216.3	91.8	295	271.5	115.3
56	51.5	21.9	116	106.8	45.3	176	162.0	68.8	236	217.2	92.2	296	272.5	115.7
57	52.5	22.3	117	107.7	45.7	177	162.9	69.2	237	218.2	92.6	297	273.4	116.0
58	53.4	22.7	118	108.6	46.1	178	163.8	69.5	238	219.1	93.0	298	274.3	116.4
59	54.3	23.1	119	109.5	46.5	179	164.8	69.9	239	220.0	93.4	299	275.2	116.8
60	55.2	23.4	120	110.5	46.9	180	165.7	60.3	240	220.0	93.8	300	276.2	117.2
Dist.	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 67 Degrees.

Difference of Latitude and Departure for 24 Degrees.

Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.9	00.4	61	55.7	24.8	121	110.5	49.2	181	165.3	73.6	241	220.2	98.0
2	01.8	00.8	62	56.6	25.2	122	111.4	49.6	182	166.3	74.0	242	221.1	98.4
3	02.7	01.2	63	57.6	25.6	123	112.4	50.0	183	167.2	74.4	243	222.0	98.8
4	03.7	01.6	64	58.5	26.0	124	113.3	50.4	184	168.1	74.8	244	222.9	99.2
5	04.6	02.0	65	59.4	26.4	125	114.2	50.8	185	169.0	75.2	245	223.8	99.6
6	05.5	02.4	66	60.3	26.8	126	115.1	51.2	186	170.9	75.6	246	224.7	100.0
7	06.4	02.8	67	61.2	27.2	127	116.0	51.7	187	170.8	76.1	247	225.6	100.5
8	07.3	03.3	68	62.1	27.7	128	116.9	52.1	188	171.7	76.5	248	226.5	100.9
9	08.2	03.7	69	63.0	28.1	129	117.8	52.5	189	172.7	76.9	249	227.5	101.3
10	09.1	04.1	70	63.9	28.5	130	118.8	52.9	190	173.6	77.3	250	228.4	101.7
11	10.0	04.5	71	64.9	28.9	131	119.7	53.3	191	174.5	77.7	251	229.3	102.1
12	11.0	04.9	72	65.8	29.3	132	120.6	53.7	192	175.4	78.1	252	230.2	102.5
13	11.9	05.3	73	66.7	29.7	133	121.5	54.1	193	176.3	78.5	253	231.1	102.9
14	12.8	05.7	74	67.6	30.1	134	122.4	54.5	194	177.2	78.9	254	232.0	103.3
15	13.7	06.1	75	68.5	30.5	135	123.3	54.9	195	178.1	79.3	255	232.9	103.7
16	14.6	06.5	76	69.4	30.9	136	124.2	55.3	196	179.0	79.7	256	233.9	104.1
17	15.5	06.9	77	70.3	31.3	137	125.1	55.7	197	180.0	80.1	257	234.8	104.5
18	16.4	07.3	78	71.3	31.7	148	126.1	56.2	198	180.9	80.5	258	235.7	104.9
19	17.4	07.7	79	72.2	32.1	139	127.0	56.5	199	181.8	80.9	259	236.6	105.3
20	18.3	08.1	80	73.1	32.5	140	127.9	56.9	200	182.7	81.3	260	237.5	105.7
21	19.2	08.5	81	74.0	32.9	141	128.8	57.3	201	183.6	81.7	261	238.4	106.1
22	20.1	08.9	82	74.9	33.3	142	129.7	57.8	202	184.5	82.2	262	239.3	106.6
23	21.0	09.4	83	75.8	33.8	143	130.6	58.2	203	185.4	82.6	263	240.3	107.0
24	21.9	09.8	84	76.7	34.2	144	131.5	58.6	204	186.4	83.0	264	241.2	107.4
25	22.8	10.2	85	77.6	34.6	145	132.5	59.0	205	187.3	83.4	265	242.1	107.8
26	23.8	10.6	86	78.6	35.0	146	133.4	59.4	206	188.2	83.8	266	243.0	108.2
27	24.7	11.0	87	79.5	35.4	147	134.3	59.8	207	189.1	84.2	267	243.9	108.6
28	25.6	11.4	88	80.4	35.8	148	135.2	60.2	208	190.0	84.6	268	244.8	109.0
29	26.5	11.8	89	81.3	36.2	149	136.1	60.6	209	190.9	85.0	269	245.7	109.4
30	27.4	12.2	90	82.2	36.6	150	137.0	61.0	210	191.8	85.4	270	246.6	109.8
31	28.3	12.6	91	83.1	37.0	151	137.9	61.4	211	192.7	85.8	271	247.6	110.2
32	29.2	13.0	92	84.0	37.4	152	138.9	61.8	212	193.7	86.2	272	248.5	110.6
33	30.1	13.4	93	85.0	37.8	153	139.8	62.2	213	194.6	86.6	273	249.4	111.0
34	31.1	13.8	94	85.9	38.2	154	140.7	62.6	214	195.5	87.0	274	250.3	111.4
35	32.0	14.2	95	86.8	38.6	155	141.6	63.0	215	196.4	87.4	275	251.2	111.8
36	32.9	14.6	96	87.7	39.0	156	142.5	63.4	216	197.3	87.8	276	252.1	112.2
37	33.8	15.0	97	88.6	39.4	157	143.4	63.9	217	198.2	88.3	277	253.0	112.7
38	34.7	15.5	98	89.5	39.9	158	144.3	64.3	218	199.1	88.7	278	254.0	113.1
39	35.6	15.9	99	90.4	40.3	159	145.2	64.7	219	200.1	89.1	279	254.9	113.5
40	36.5	16.3	100	91.4	40.7	160	146.2	65.1	220	201.0	89.5	280	255.8	113.9
41	37.5	16.7	101	92.3	41.1	161	147.1	65.5	221	201.9	89.9	281	256.7	114.3
42	38.4	17.1	102	93.2	41.5	162	148.0	65.9	222	202.8	90.3	282	257.6	114.7
43	39.3	17.5	103	94.1	41.9	163	148.9	66.3	223	203.7	90.7	283	258.5	115.1
44	40.2	17.9	104	95.0	42.3	164	149.8	66.7	224	204.6	91.1	284	259.4	115.5
45	41.1	18.3	105	95.9	42.7	165	150.7	67.1	225	205.5	91.5	285	260.3	115.9
46	42.0	18.7	106	96.8	43.1	166	151.6	67.5	226	206.5	91.9	286	261.3	116.3
47	42.9	19.1	107	97.7	43.5	167	152.6	67.9	227	207.4	92.3	287	162.2	116.7
48	43.8	19.5	108	98.7	43.9	168	153.5	68.3	228	208.3	92.7	288	263.1	117.1
49	44.8	19.9	109	99.6	44.3	169	154.4	68.7	229	209.2	93.1	289	264.0	117.5
50	45.7	20.3	110	100.5	44.7	170	155.3	69.1	230	210.1	93.5	290	264.9	117.9
51	46.6	20.7	111	101.4	45.1	171	156.2	69.5	231	211.0	93.9	291	265.8	118.3
52	47.5	21.1	112	102.3	45.6	172	157.1	70.0	232	211.9	94.4	292	266.7	118.8
53	48.4	21.6	113	103.2	86.0	173	158.0	70.4	233	212.8	94.8	293	267.7	119.2
54	49.3	22.0	114	104.1	46.4	174	158.9	70.8	234	213.8	95.2	294	268.6	119.6
55	50.2	22.4	115	105.1	46.8	175	159.9	71.2	235	214.7	95.6	295	269.5	120.0
56	51.2	22.8	116	106.0	47.2	176	160.8	71.6	236	215.6	96.0	296	270.4	120.4
57	52.1	23.2	117	106.9	47.6	177	161.7	72.0	237	216.5	96.4	297	271.3	120.8
58	53.0	23.6	118	107.8	48.0	178	162.6	72.4	238	217.4	96.8	298	272.2	121.2
59	53.9	24.0	119	108.7	48.4	179	163.5	72.8	239	218.3	97.2	299	273.1	121.6
60	54.8	24.4	120	109.6	48.8	180	164.4	73.2	240	219.2	97.6	300	274.1	122.0
Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 66 Degrees.

Difference of Latitude and Departure for 25 Degrees.

Dift.	Lat.	Dep.	Dift	Lat.	Dep.	Dift	Lat.	Dep.	Dift	Lat.	Dep.	Dift	Lat.	Dep.
1	00.9	00.4	61	55.3	25.8	121	109.7	51.1	181	164.0	76.5	241	218.4	101.8
2	01.8	00.8	62	56.2	26.2	122	110.6	51.6	182	164.9	76.9	242	219.3	102.3
3	02.7	01.3	63	57.1	26.6	123	111.5	52.0	183	165.9	77.3	243	220.2	102.7
4	03.6	01.7	64	58.0	27.0	124	112.4	52.4	184	166.8	77.8	244	221.1	103.1
5	04.5	02.1	65	58.9	27.5	125	113.3	52.8	185	167.7	78.2	245	222.0	103.5
6	05.4	02.5	66	59.8	27.9	126	114.2	53.2	186	168.6	78.6	246	222.9	104.0
7	06.3	03.0	67	60.7	28.3	127	115.1	53.7	187	169.5	79.0	247	223.9	104.4
8	07.3	03.4	68	61.6	28.7	128	116.0	54.1	188	170.4	79.4	248	224.8	104.8
9	08.2	03.8	69	62.5	29.2	129	116.9	54.5	189	171.3	79.9	249	225.7	105.2
10	09.1	04.2	70	63.4	29.6	130	117.8	54.9	190	172.2	80.3	250	226.6	105.7
11	10.0	04.6	71	64.3	30.0	131	118.7	55.4	191	173.1	80.7	251	227.5	106.1
12	10.9	05.0	72	65.3	30.4	132	119.6	55.8	192	174.0	81.1	252	228.4	106.5
13	11.8	05.5	73	66.2	30.8	133	120.5	56.2	193	174.9	81.6	253	229.3	106.9
14	12.7	05.9	74	67.1	31.3	134	121.4	56.6	194	175.8	82.0	254	230.2	107.3
15	13.6	06.3	75	68.0	31.7	135	122.4	57.1	195	176.7	82.4	255	231.1	107.8
16	14.5	06.8	76	68.9	32.1	136	123.3	57.5	196	177.6	82.8	256	232.0	108.2
17	15.4	07.2	77	69.8	32.5	137	124.2	57.9	197	178.5	83.3	257	232.9	108.6
18	16.3	07.6	78	70.7	33.0	138	125.1	58.3	198	179.4	83.7	258	233.8	109.0
19	17.2	08.0	79	71.6	33.4	139	126.0	58.7	199	180.3	84.1	259	234.7	109.5
20	18.1	08.5	80	72.5	33.8	140	126.9	59.2	200	181.3	84.5	260	235.6	109.9
21	19.0	08.9	81	73.4	34.2	141	127.8	59.6	201	182.2	84.9	261	236.5	110.3
22	19.9	09.3	82	74.3	34.7	142	128.7	60.0	202	183.1	85.4	262	237.5	110.7
23	20.8	09.7	83	75.2	35.1	143	129.6	60.4	203	184.0	85.8	263	238.4	111.1
24	21.8	10.1	84	76.1	35.5	144	130.5	60.9	204	184.9	86.2	264	239.3	111.6
25	22.7	10.6	85	77.0	35.9	145	131.4	61.3	205	185.8	86.6	265	240.2	112.0
26	23.6	11.0	86	77.9	36.3	146	132.3	61.7	206	186.7	87.1	266	241.1	112.4
27	24.5	11.4	87	78.8	36.8	147	133.2	62.1	207	187.6	87.5	267	242.0	112.8
28	25.4	11.8	88	79.8	37.2	148	134.1	62.5	208	188.5	87.9	268	242.9	113.3
29	26.3	12.3	89	80.7	37.6	149	135.0	63.0	209	189.4	88.3	269	243.8	113.7
30	27.2	12.7	90	81.6	38.0	150	135.9	63.4	210	190.3	88.7	270	244.7	114.1
31	28.1	13.1	91	82.5	38.5	151	136.9	63.8	211	191.2	89.2	271	245.6	114.5
32	29.0	13.5	92	83.4	38.9	152	137.8	64.2	212	192.1	89.6	272	246.5	114.9
33	29.9	13.9	93	84.3	39.3	153	138.7	64.7	213	193.0	90.0	273	247.4	115.4
34	30.8	14.4	94	85.2	39.7	154	139.6	65.1	214	193.9	90.4	274	248.3	115.8
35	31.7	14.8	95	86.1	40.1	155	140.5	65.5	215	194.9	90.9	275	249.2	116.2
36	32.6	15.2	96	87.0	40.6	156	141.4	65.9	216	195.8	91.3	276	250.1	116.6
37	33.5	15.6	97	87.9	41.0	157	142.3	66.3	217	196.7	91.7	277	251.0	117.1
38	34.4	16.1	98	88.8	41.4	158	143.2	66.8	218	197.6	92.1	278	252.0	117.5
39	35.3	16.5	99	89.7	41.8	159	144.1	67.2	219	198.5	92.5	279	252.9	117.9
40	36.3	16.9	100	90.6	42.3	160	145.0	67.6	220	199.4	93.0	280	253.8	118.3
41	37.2	17.3	101	91.5	42.7	161	145.9	68.0	221	200.3	93.4	281	254.7	118.8
42	38.1	17.7	102	92.4	43.1	162	146.8	68.5	222	201.2	93.8	282	255.6	119.2
43	39.0	18.2	103	93.3	43.5	163	147.7	68.9	223	202.1	94.2	283	256.5	119.6
44	39.9	18.6	104	94.3	44.0	164	148.6	69.3	224	203.0	94.7	284	257.4	120.0
45	40.8	19.0	105	95.2	44.4	165	149.5	69.7	225	203.9	95.1	285	258.3	120.4
46	41.7	19.4	106	96.1	44.8	166	150.4	70.2	226	204.8	95.5	286	259.2	120.9
47	42.6	19.9	107	97.0	45.2	167	151.4	70.6	227	205.7	95.9	287	260.1	121.3
48	43.5	20.3	108	97.9	45.6	168	152.3	71.0	228	206.6	96.4	288	261.0	121.7
49	44.4	20.7	109	98.8	46.1	169	153.2	71.4	229	207.5	96.8	289	261.9	122.1
50	45.3	21.1	110	99.7	46.5	170	154.1	71.8	230	208.4	97.2	290	262.8	122.6
51	46.2	21.6	111	100.6	46.9	171	155.0	72.3	231	209.4	97.6	291	263.7	123.0
52	47.1	22.0	112	101.5	47.3	172	155.9	72.7	232	210.3	98.0	292	264.6	123.4
53	48.0	22.4	113	102.4	47.8	173	156.8	73.1	233	211.2	98.5	293	265.5	123.8
54	48.9	22.8	114	103.3	48.2	174	157.7	73.5	234	212.1	98.9	294	266.5	124.2
55	49.8	23.2	115	104.2	48.6	175	158.6	74.0	235	213.0	99.3	295	267.4	124.7
56	50.8	23.7	116	105.1	49.0	176	159.5	74.4	236	213.9	99.7	296	268.3	125.1
57	51.7	24.1	117	106.0	49.4	177	160.4	74.8	237	214.8	100.2	297	269.2	125.5
58	52.7	24.5	118	106.9	49.9	178	161.3	75.2	238	215.7	100.6	298	270.1	125.6
59	53.5	24.9	119	107.8	50.3	179	162.2	75.6	239	216.6	101.0	299	271.0	126.4
60	54.4	25.4	120	108.8	50.7	180	163.1	76.1	240	217.5	101.4	300	271.9	126.8
Dift.	Dep.	Lat.	Dift	Dep.	Lat.	Dift	Dep.	Lat.	Dift	Dep.	Lat.	Dift	Dep.	Lat.

For 65 Degrees.

Difference of Latitude and Departure for 26 Degrees.

Diſt.	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.
1	00.9	00.4	61	54.8	26.7	121	108.8	53.0	181	162.7	79.4	241	216.6	105.7
2	01.8	00.9	62	55.7	27.2	122	109.7	53.5	182	163.6	79.8	242	217.5	106.1
3	02.7	01.3	63	56.6	27.6	123	110.6	53.9	183	164.5	80.2	243	218.4	106.5
4	03.6	01.8	64	57.5	28.1	124	111.5	54.4	184	165.4	80.7	244	219.3	107.0
5	04.5	02.2	65	58.4	28.5	125	112.4	54.8	185	166.3	81.1	245	220.2	107.4
6	05.4	02.6	66	59.3	28.9	126	113.2	55.2	186	167.2	81.5	246	221.1	107.8
7	06.3	03.1	67	60.2	29.4	127	114.1	55.7	187	168.1	82.0	247	222.0	108.3
8	07.2	03.5	68	61.1	29.8	128	115.0	56.1	188	169.0	82.4	248	222.9	108.7
9	08.1	03.9	69	62.0	30.2	129	115.9	56.6	189	169.9	82.9	249	223.8	109.2
10	09.0	04.4	70	62.9	30.7	130	116.8	57.0	190	170.8	83.3	250	224.7	109.6
11	09.9	04.8	71	63.8	31.1	131	117.7	57.4	191	171.7	83.7	251	225.6	110.0
12	10.8	05.3	72	64.7	31.6	132	118.6	57.9	192	172.6	84.2	252	226.5	110.5
13	11.7	05.7	73	65.6	32.0	133	119.5	58.3	193	173.5	84.6	253	227.4	110.9
14	12.6	06.1	74	66.5	32.4	134	120.4	58.7	194	174.4	85.0	254	228.3	111.4
15	13.5	06.6	75	67.4	32.9	135	121.3	59.2	195	175.3	85.5	255	229.2	111.8
16	14.4	07.0	76	68.3	33.3	136	122.2	59.6	196	176.2	85.9	256	230.1	112.2
17	15.3	07.5	77	69.2	33.8	137	123.1	60.1	197	177.1	86.4	257	231.0	112.7
18	16.2	07.9	78	70.1	34.2	138	124.0	60.5	198	178.0	86.8	258	231.9	113.1
19	17.1	08.3	79	71.0	34.6	139	124.9	60.9	199	178.9	87.2	259	232.8	113.5
20	18.0	08.7	80	71.9	35.1	140	125.8	61.4	100	179.8	87.7	260	233.7	114.0
21	18.9	09.2	81	72.8	35.5	141	126.7	61.8	101	180.7	88.1	261	234.6	114.4
22	19.8	09.6	82	73.7	35.9	142	127.6	62.3	102	181.6	88.6	262	235.5	114.9
23	20.7	10.1	83	74.6	36.4	143	128.5	62.7	103	182.5	89.0	263	236.4	115.3
24	21.6	10.5	84	75.5	36.8	144	129.4	63.1	104	183.4	89.4	264	237.3	115.7
25	22.5	11.0	85	76.4	37.3	145	130.3	63.6	105	184.3	80.9	265	238.2	116.2
26	23.4	11.4	86	77.3	37.7	146	131.2	64.0	106	185.2	90.3	266	239.1	116.6
27	24.3	11.8	87	78.2	38.1	147	132.1	64.4	107	186.1	90.7	267	240.0	117.0
28	25.2	12.3	88	79.1	38.6	148	133.0	64.9	108	187.0	91.2	268	240.9	117.5
29	26.1	12.7	89	80.0	39.0	149	133.9	65.3	109	187.8	91.6	269	241.8	117.9
30	27.0	13.2	90	80.9	39.5	150	134.8	65.8	110	188.7	92.1	270	242.7	118.4
31	27.9	13.6	91	81.8	39.9	151	135.7	66.2	211	189.6	92.5	271	243.6	118.8
32	28.8	14.0	92	82.7	40.3	152	136.6	66.6	212	190.5	92.9	272	244.5	119.2
33	29.7	14.5	93	83.6	40.8	153	137.5	67.1	213	191.4	93.4	273	245.4	119.7
34	30.6	14.9	94	84.5	41.2	154	138.4	67.5	214	192.3	93.8	274	246.3	120.1
35	31.5	15.3	95	85.4	41.6	155	139.3	68.0	215	193.2	94.3	275	247.2	120.6
36	32.4	15.8	96	86.3	42.1	156	140.2	68.4	216	194.1	94.7	276	248.1	121.0
37	33.3	16.2	97	87.2	42.5	157	141.1	68.8	217	195.0	95.1	277	249.0	121.4
38	34.2	16.7	98	88.1	43.0	158	142.0	69.3	218	195.9	95.6	278	249.9	121.9
39	35.1	17.1	99	89.0	43.4	159	142.9	69.7	219	196.8	96.0	279	250.8	122.3
40	36.0	17.5	100	89.9	43.8	160	143.8	70.1	220	197.7	96.4	280	251.7	122.8
41	36.9	18.0	101	90.8	44.3	161	144.7	70.6	221	198.6	96.9	281	252.6	123.2
42	37.7	18.4	102	91.7	44.7	162	145.6	71.0	222	199.5	97.3	282	253.5	123.6
43	38.6	18.9	103	92.6	45.2	163	146.5	71.5	223	200.4	97.8	283	254.4	124.1
44	39.5	19.3	104	93.5	45.6	164	147.4	71.9	224	201.3	98.2	284	255.3	124.5
45	40.4	19.7	105	94.4	46.0	165	148.3	72.3	225	202.2	98.6	285	256.2	124.9
46	41.3	20.2	106	95.3	46.5	166	149.2	72.8	226	203.1	99.1	286	257.1	125.4
47	42.2	20.6	107	96.2	46.9	167	150.1	73.2	227	204.0	99.5	287	258.0	125.8
48	43.1	21.0	108	97.1	47.3	168	151.0	73.7	228	204.9	100.0	288	258.9	126.3
49	44.0	21.5	109	98.0	47.8	169	151.9	74.1	229	205.8	100.4	289	259.8	126.7
50	44.9	21.9	110	98.9	48.2	170	152.8	74.5	230	206.7	100.8	290	260.7	127.1
51	45.8	22.4	111	99.8	48.7	171	153.7	75.0	231	207.6	101.3	291	261.6	127.6
52	46.7	22.8	112	100.7	49.1	172	154.6	75.4	232	208.5	101.7	292	262.4	128.0
53	47.6	23.2	113	101.6	49.5	173	155.5	75.8	233	209.4	102.1	293	263.3	128.5
54	48.5	23.7	114	102.5	50.0	174	156.4	76.3	234	210.3	102.6	294	264.2	128.9
55	49.4	24.1	115	103.4	50.4	175	157.3	76.7	235	211.2	103.0	295	265.1	129.3
56	50.3	24.6	116	104.3	50.9	176	158.2	77.2	236	212.1	103.5	296	266.0	129.8
57	51.2	25.0	117	105.2	51.3	177	159.1	77.6	237	213.0	103.9	297	266.9	130.2
58	52.1	25.4	118	106.1	51.7	178	160.0	78.0	238	213.9	104.3	298	267.8	130.6
59	53.0	25.9	119	107.0	52.2	179	160.9	78.5	239	214.8	104.8	299	268.7	131.1
60	53.9	26.3	120	107.9	52.6	180	161.8	78.9	240	215.7	105.2	300	269.6	131.5
Diſt.	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.

for 64 Degrees.

Difference of Latitude and Departure for 27 Degrees.

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	00.9	00.5	61	54.4	27.7	121	107.8	54.9	181	161.3	82.2	241	214.7	109.4
2	01.8	00.9	62	55.2	28.1	122	108.7	55.4	182	162.2	82.6	242	215.6	109.9
3	02.7	01.4	63	56.1	28.6	123	109.6	55.8	183	163.1	83.1	243	216.5	110.3
4	03.6	01.8	64	57.0	29.1	124	110.5	56.3	184	163.9	83.5	244	217.4	110.8
5	04.5	02.3	65	57.9	29.5	125	111.4	56.8	185	164.8	84.0	245	218.3	111.2
6	05.3	02.7	66	58.8	30.0	126	112.3	57.2	186	165.7	84.4	246	219.2	111.7
7	06.2	03.2	67	59.7	30.4	127	113.2	57.7	187	166.6	84.9	247	220.1	112.1
8	07.1	03.6	68	60.6	30.9	128	114.0	58.1	188	167.5	85.4	248	221.0	112.6
9	08.0	04.1	69	61.5	31.3	129	114.9	58.6	189	168.4	85.8	249	221.9	113.0
10	08.9	04.5	70	62.4	31.8	130	115.8	59.0	190	169.3	86.3	250	222.8	113.5
11	09.8	05.0	71	63.3	32.2	131	116.7	59.5	191	170.2	86.7	251	223.6	114.0
12	10.7	05.4	72	64.2	32.7	132	117.6	59.9	192	171.1	87.2	252	224.5	114.4
13	11.6	05.9	73	65.0	33.1	133	118.5	60.4	193	172.0	87.6	253	225.4	114.9
14	12.5	06.4	74	65.9	33.6	134	119.4	60.8	194	172.9	88.1	254	226.3	115.3
15	13.4	06.8	75	66.8	34.1	135	120.3	61.3	195	173.7	88.5	255	227.2	115.8
16	14.3	07.3	76	67.7	34.5	136	121.2	61.7	196	174.6	89.0	256	228.1	116.2
17	15.1	07.7	77	68.6	35.0	137	122.1	62.2	197	175.5	89.4	257	229.0	116.7
18	16.0	08.2	78	69.5	35.4	138	123.0	62.7	198	176.4	89.9	258	229.9	117.1
19	16.9	08.6	79	70.4	35.9	139	123.8	63.1	199	177.3	90.3	259	230.8	117.5
20	17.8	09.1	80	71.3	36.3	140	124.7	63.6	200	178.2	90.8	260	231.7	118.0
21	18.7	09.5	81	72.2	36.8	141	125.6	64.0	201	179.1	91.3	261	232.6	118.5
22	19.6	10.0	82	73.1	37.2	142	126.5	64.5	202	180.0	91.7	262	233.4	118.9
23	20.5	10.4	83	74.0	37.7	143	127.4	64.9	203	180.9	92.2	263	234.3	119.4
24	21.4	10.9	84	74.8	38.1	144	128.3	65.4	204	181.8	92.6	264	235.2	119.9
25	22.3	11.4	85	75.7	38.6	145	129.2	65.8	205	182.7	93.1	265	236.1	120.3
26	23.2	11.8	86	76.6	39.0	146	130.1	66.3	206	183.5	93.5	266	237.0	120.8
27	24.1	12.3	87	77.5	39.5	147	131.0	66.7	207	184.4	94.0	267	237.9	121.2
28	24.9	12.7	88	78.4	40.0	148	131.9	67.2	208	185.3	94.4	268	238.8	121.7
29	25.8	13.2	89	79.3	40.4	149	132.8	67.6	209	186.2	94.9	269	239.7	122.1
30	26.7	13.6	90	80.2	40.9	150	133.7	68.1	210	187.1	95.3	270	240.6	122.6
31	27.6	14.1	91	81.1	41.3	151	134.5	68.6	211	188.0	95.8	271	241.5	123.3
32	28.5	14.5	92	82.0	41.8	152	135.4	69.0	212	188.9	96.2	272	242.4	123.5
33	29.4	15.0	93	82.9	42.2	153	136.3	69.5	213	189.8	96.7	273	243.2	123.9
34	30.3	15.4	94	83.8	42.7	154	137.2	69.9	214	190.7	97.2	274	244.1	124.4
35	31.2	15.9	95	84.6	43.1	155	138.1	70.4	215	191.6	97.6	275	245.0	124.9
36	32.1	16.3	96	85.5	43.6	156	139.0	70.8	216	192.5	98.1	276	245.9	125.3
37	33.0	16.8	97	86.4	44.0	157	139.9	71.3	217	193.3	98.5	277	246.8	125.8
38	33.9	17.3	98	87.3	44.5	158	140.8	71.7	218	194.2	99.0	278	247.7	126.2
39	34.7	17.7	99	88.2	44.9	159	141.7	72.2	219	195.1	99.4	279	248.6	126.7
40	35.6	18.2	100	89.1	45.4	160	142.6	72.6	220	196.0	99.9	280	249.5	127.1
41	36.5	18.6	101	90.0	45.9	161	143.5	73.1	221	196.9	100.3	281	250.4	127.6
42	37.4	19.1	102	90.9	46.3	162	144.3	73.5	222	197.8	100.8	282	251.3	128.0
43	38.3	19.5	103	91.8	46.8	163	145.2	74.0	223	198.7	101.2	283	252.2	128.5
44	39.2	20.0	104	92.7	47.2	164	146.1	74.5	224	199.6	101.7	284	253.0	128.9
45	40.1	20.4	105	93.6	47.7	165	147.0	74.9	225	200.5	102.2	285	253.6	129.4
46	41.0	20.9	106	94.4	48.1	166	147.9	75.4	226	201.4	102.6	285	254.8	129.8
47	41.9	21.3	107	95.3	48.6	167	148.8	75.8	227	202.3	103.1	287	255.7	130.3
48	42.8	21.8	108	96.2	49.0	168	149.7	76.3	228	203.1	103.5	288	256.6	130.8
49	43.7	22.2	109	97.1	49.5	169	150.6	76.7	229	204.0	104.0	289	257.5	131.2
50	44.6	22.7	110	98.0	49.9	170	151.5	77.2	230	204.9	104.4	290	258.4	131.7
51	45.4	23.2	111	98.9	50.4	171	152.4	77.6	231	205.8	104.9	291	259.3	132.1
52	46.3	23.6	112	99.8	50.8	172	153.3	78.1	232	206.7	105.3	292	260.2	132.6
53	47.2	24.1	113	100.7	51.3	173	154.1	78.5	233	207.6	105.8	293	261.1	133.0
54	48.1	24.5	114	101.6	51.8	174	155.0	79.0	234	208.5	106.2	294	262.0	133.5
55	49.0	25.0	115	102.5	52.2	175	155.0	79.5	235	209.4	106.7	295	262.8	133.9
56	49.9	25.4	116	103.4	52.7	176	156.8	79.9	236	210.3	107.1	296	263.7	134.4
57	50.8	25.9	117	104.2	53.1	177	157.7	80.4	237	211.2	107.6	297	264.6	134.8
58	51.7	26.3	118	105.1	53.6	178	158.6	80.8	238	212.1	108.1	298	265.5	135.3
59	52.6	26.8	119	106.0	54.0	179	159.5	81.3	239	212.9	108.5	299	266.4	135.7
60	53.5	27.2	120	106.9	54.5	180	160.4	81.7	240	213.8	109.0	300	267.3	136.2
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

for 63 Degrees.

Difference of Latitude and Departure for 28 Degrees.

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	00.9	00.5	61	53.9	28.6	121	106.8	56.8	181	159.8	85.0	241	212.8	113.1
2	01.8	00.9	62	54.7	29.1	122	107.7	57.3	182	160.7	85.4	242	213.7	113.6
3	02.6	01.4	63	55.6	29.6	123	108.6	57.7	183	161.6	85.9	243	214.6	114.1
4	03.5	01.9	64	56.5	30.0	124	109.5	58.2	184	162.5	86.4	244	215.5	114.6
5	04.4	02.3	65	57.4	30.5	125	110.4	58.7	185	163.4	86.9	245	216.3	115.0
6	05.3	02.8	66	58.3	31.0	126	111.3	59.2	186	164.2	87.3	246	217.2	115.5
7	06.2	03.3	67	59.2	31.5	127	112.1	59.6	187	165.1	87.8	247	218.1	115.9
8	07.1	03.8	68	60.0	31.9	128	113.0	60.1	188	166.0	88.3	248	219.0	116.4
9	07.9	04.3	69	60.9	32.4	129	113.9	60.6	189	166.9	88.7	249	219.9	116.9
10	08.8	04.7	70	61.8	32.9	130	114.8	61.0	190	167.8	89.2	250	220.8	117.4
11	09.7	05.2	71	62.7	33.3	131	115.7	61.5	191	168.7	89.7	251	221.6	117.8
12	10.6	05.6	72	63.6	33.8	132	116.6	62.0	192	169.5	90.1	252	222.5	118.3
13	11.5	06.1	73	64.5	34.3	133	117.4	62.4	193	170.4	90.6	253	223.4	118.8
14	12.4	06.6	74	65.3	34.7	134	118.3	62.9	194	171.3	91.1	254	224.3	119.2
15	13.2	07.0	75	66.2	35.2	135	119.2	63.4	195	172.2	91.6	255	225.2	119.7
16	14.1	07.5	76	67.1	35.7	136	120.1	63.9	196	173.1	92.0	256	226.0	120.2
17	15.0	08.0	77	68.0	36.2	137	121.0	64.3	197	174.0	92.5	257	226.9	120.7
18	15.9	08.5	78	68.9	36.6	138	121.9	64.8	198	174.8	93.0	258	227.8	121.1
19	16.8	08.9	79	69.8	37.1	139	122.7	65.3	199	175.7	93.4	259	228.7	121.6
20	17.7	09.4	80	70.6	37.6	140	123.6	65.7	200	176.6	93.9	260	229.6	122.1
21	18.5	09.9	81	71.5	38.0	141	124.5	66.2	201	177.5	94.4	261	230.5	122.5
22	19.4	10.3	82	72.4	38.5	142	125.4	66.7	202	178.4	94.8	262	231.3	123.0
23	20.3	10.8	83	73.3	39.0	143	126.3	67.1	203	179.2	95.3	263	232.2	123.5
24	21.2	11.3	84	74.2	39.4	144	127.2	67.6	204	180.1	95.8	264	233.1	123.9
25	22.1	11.7	85	75.1	39.9	145	128.0	68.1	205	181.0	96.2	265	234.0	124.4
26	23.0	12.2	86	75.9	40.4	146	128.9	68.5	206	181.9	96.7	266	234.9	124.9
27	23.8	12.7	87	76.8	40.8	147	129.8	69.0	207	182.8	97.2	267	235.8	125.4
28	24.7	13.1	88	77.7	41.3	148	130.7	69.5	208	183.7	97.7	268	236.6	125.8
29	25.6	13.6	89	78.6	41.8	149	131.6	70.0	209	184.5	98.1	269	237.5	126.3
30	26.5	14.1	90	79.5	42.3	150	132.5	70.4	210	185.4	98.6	270	238.4	126.8
31	27.4	14.6	91	80.4	42.7	151	133.3	70.9	211	186.3	99.1	271	239.3	127.2
32	28.3	15.0	92	81.2	43.2	152	134.2	71.4	212	187.2	99.5	272	240.2	127.7
33	29.1	15.5	93	82.1	43.7	153	135.1	71.8	213	188.1	100.0	273	241.1	128.2
34	30.0	16.0	94	83.0	44.1	154	136.0	72.3	214	189.0	100.5	274	241.9	128.6
35	30.9	16.4	95	83.9	44.6	155	136.9	72.8	215	189.8	100.9	275	242.8	129.1
36	31.8	16.9	96	84.8	45.1	156	137.7	73.2	216	190.7	101.4	276	243.7	129.6
37	32.7	17.4	97	85.7	45.5	157	138.6	73.7	217	191.6	101.9	277	244.6	130.1
38	33.6	17.8	98	86.5	46.0	158	139.5	74.2	218	192.5	102.4	278	245.5	130.5
39	34.5	18.3	99	87.4	46.5	159	140.4	74.6	219	193.4	102.8	279	246.4	131.0
40	35.3	18.8	100	88.3	47.0	160	141.3	75.1	220	194.3	103.4	280	247.2	131.5
41	36.2	19.2	101	89.2	47.4	161	142.2	75.6	221	195.1	103.8	281	248.1	131.9
42	37.1	19.7	102	90.1	47.9	162	143.0	76.1	222	196.0	104.2	282	249.0	132.4
43	38.0	20.2	103	90.9	48.4	163	143.9	76.5	223	196.9	104.7	283	249.9	132.9
44	38.9	20.7	104	91.8	48.8	164	144.8	77.0	224	197.8	105.2	284	250.8	133.3
45	39.7	21.1	105	92.7	49.3	165	145.7	77.5	225	198.7	105.6	285	251.7	133.8
46	40.6	21.6	106	93.6	49.8	166	146.6	77.9	226	199.6	106.1	286	252.5	134.3
47	41.5	22.1	107	94.5	50.2	167	147.5	78.4	227	200.4	106.6	287	253.4	134.7
48	42.4	22.5	108	95.4	50.7	168	148.3	78.9	228	201.3	107.0	288	254.3	135.2
49	43.3	23.0	109	96.2	51.2	169	149.2	79.3	229	202.2	107.5	289	255.2	135.7
50	44.2	23.5	110	97.1	51.6	170	150.1	79.8	230	203.1	108.0	290	256.1	136.1
51	45.0	23.9	111	98.0	52.1	171	151.0	80.3	231	204.0	108.5	291	257.0	136.6
52	45.9	24.4	112	98.9	52.6	172	151.9	80.8	232	204.9	108.9	292	257.8	137.1
53	46.8	24.9	113	99.8	53.1	173	152.8	81.2	233	205.7	109.4	293	258.7	137.6
54	47.7	25.4	114	100.7	53.5	174	153.6	81.7	234	206.6	109.9	294	259.6	138.0
55	48.6	25.8	115	101.5	54.0	175	154.5	82.2	235	207.5	110.3	295	260.5	138.5
56	49.4	26.3	116	102.4	54.5	176	155.4	82.6	236	208.4	110.8	296	261.4	139.0
57	50.3	26.8	117	103.3	54.9	177	156.3	83.1	237	209.3	111.3	297	262.3	139.4
58	51.2	27.2	118	104.2	55.4	178	157.2	83.6	238	210.2	111.7	298	263.1	139.9
59	52.1	27.7	119	105.1	55.9	179	158.1	84.0	239	211.0	112.2	299	264.0	140.4
60	53.0	28.2	120	106.0	56.3	180	158.9	84.5	240	211.9	112.7	300	264.9	140.9
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

for 62 Degrees.

Difference of Latitude and Departure for 29 Degrees.

Diff.	Lat.	Dep.	Diff.	Lat.	Dep.	Diff.	Lat.	Dep.	Diff.	Lat.	Dep.	Diff.	Lat.	Dep.
1	00.9	00.5	61	53.4	29.6	121	105.8	58.7	181	158.3	87.7	241	210.8	116.8
2	01.7	01.0	62	54.2	30.1	122	106.7	59.1	182	159.2	88.2	242	211.7	117.3
3	02.6	01.5	63	55.1	30.5	123	107.6	59.6	183	160.1	88.7	243	212.5	117.8
4	03.5	01.9	64	56.0	31.0	124	108.5	60.1	184	160.9	89.2	244	213.4	118.3
5	04.4	02.4	65	56.8	31.5	125	109.3	60.6	185	161.8	89.7	245	214.3	118.8
6	05.2	02.9	66	57.7	32.0	126	110.2	61.1	186	162.7	90.2	246	215.2	119.3
7	06.1	03.4	67	58.6	32.5	127	111.1	61.6	187	163.6	90.7	247	216.0	119.7
8	07.0	03.9	68	59.5	33.0	128	111.9	62.1	188	164.4	91.1	248	216.9	120.2
9	07.9	04.4	69	60.3	33.5	129	112.8	62.5	189	165.3	91.6	249	217.9	120.7
10	08.7	04.8	70	61.2	33.9	130	113.7	63.0	190	166.2	92.1	250	218.7	121.2
11	09.6	05.3	71	62.1	34.4	131	114.6	63.5	191	167.0	92.6	251	219.5	121.7
12	10.5	05.8	72	63.0	34.9	132	115.4	64.0	192	167.9	93.1	252	220.4	122.2
13	11.4	06.3	73	63.8	35.4	133	116.3	64.5	193	168.8	93.6	253	221.3	122.7
14	12.2	06.8	74	64.7	35.9	134	117.2	65.0	194	169.7	94.1	254	222.2	123.1
15	13.1	07.3	75	65.6	36.4	135	118.1	65.4	195	170.5	94.5	255	223.0	123.6
16	14.0	07.8	76	66.5	36.8	136	118.9	65.9	196	171.4	95.0	256	223.9	124.1
17	14.9	08.2	77	67.3	37.3	137	119.8	66.4	197	172.3	95.5	257	224.8	124.6
18	15.7	08.7	78	68.2	37.8	138	120.7	66.9	198	173.2	96.0	258	225.6	125.1
19	16.6	09.2	79	69.1	38.3	139	121.6	67.4	199	174.0	96.5	259	226.5	125.6
20	17.5	09.7	80	70.0	38.8	140	122.4	67.9	200	174.9	97.0	260	227.4	126.0
21	18.4	10.2	81	70.8	39.3	141	123.3	68.4	201	175.8	97.4	261	228.3	126.5
22	19.2	10.7	82	71.7	39.8	142	124.2	68.9	202	176.7	97.9	262	229.1	127.0
23	20.1	11.2	83	72.6	40.2	143	125.1	69.3	203	177.5	98.4	263	230.0	127.5
24	21.0	11.6	84	73.5	40.7	144	125.9	69.8	204	178.4	98.9	264	230.9	128.0
25	21.9	12.1	85	74.3	41.2	145	126.8	70.3	205	179.3	99.4	265	231.8	128.5
26	22.7	12.6	86	75.2	41.7	146	127.7	70.8	206	180.2	99.9	266	232.6	129.0
27	23.6	13.1	87	76.1	42.2	147	128.6	71.3	207	181.0	100.4	267	233.5	129.4
28	24.5	13.6	88	77.0	42.7	148	129.4	71.8	208	181.9	100.8	268	234.4	129.9
29	25.4	14.1	89	77.8	43.1	149	130.3	72.2	209	182.8	101.4	269	235.3	130.4
30	26.2	14.5	90	78.7	43.6	150	131.2	72.7	210	183.7	101.8	270	236.1	130.9
31	27.1	15.0	91	79.6	44.1	151	132.1	73.2	211	184.5	102.3	271	237.0	131.4
32	28.0	15.5	92	80.5	44.6	152	132.9	73.7	212	185.4	102.8	272	237.9	131.9
33	28.9	16.0	93	81.3	45.1	153	133.8	74.2	213	186.3	103.3	273	238.8	132.4
34	29.7	16.5	94	82.2	45.6	154	134.7	74.7	214	187.2	103.7	274	239.6	132.8
35	30.6	17.0	95	83.1	46.1	155	135.6	75.1	215	188.0	104.2	275	240.5	133.3
36	31.5	17.5	96	84.0	46.5	156	136.4	75.6	216	188.9	104.7	276	241.4	133.8
37	32.4	17.9	97	84.8	47.0	157	137.3	76.1	217	189.8	105.2	277	242.3	134.3
38	33.2	18.4	98	85.7	47.5	158	138.2	76.6	218	190.7	105.7	278	243.1	134.8
39	34.1	18.9	99	86.6	48.0	159	139.1	77.1	219	191.5	106.2	279	244.0	135.3
40	35.0	19.4	100	87.5	48.5	160	139.9	77.6	220	192.4	106.7	280	244.9	135.7
41	35.9	19.9	101	88.3	49.0	161	140.8	78.1	221	193.3	107.1	281	245.8	136.2
42	36.7	20.4	102	89.2	49.4	162	141.7	78.5	222	194.2	107.6	282	246.6	136.7
43	37.6	20.8	103	90.1	49.9	163	142.6	79.0	223	195.0	108.1	283	247.5	137.2
44	38.5	21.3	104	91.0	50.4	164	143.4	79.5	224	195.9	108.6	284	248.4	137.7
45	39.4	21.8	105	91.8	50.9	165	144.3	80.0	225	196.8	109.1	285	249.3	138.2
46	40.2	22.3	106	92.7	51.4	166	145.2	80.5	226	197.7	109.6	286	250.1	138.7
47	41.1	22.8	107	93.6	51.9	167	146.1	81.0	127	198.5	110.0	287	251.0	139.1
48	42.0	23.3	108	94.5	52.4	168	146.9	81.4	228	199.4	110.5	288	251.9	139.6
49	42.9	23.8	109	95.3	52.8	169	147.8	81.9	229	200.3	111.0	289	252.8	140.1
50	43.7	24.2	110	96.2	53.3	170	148.7	82.4	230	201.2	111.5	290	253.6	140.6
51	44.6	24.7	111	97.1	53.8	171	149.6	82.9	231	202.0	112.0	291	254.5	141.1
52	45.5	25.2	112	98.0	54.3	172	150.4	83.4	232	202.9	112.5	292	255.4	141.6
53	46.4	25.7	113	98.8	54.8	173	151.3	83.9	233	203.8	113.0	293	256.3	142.0
54	47.2	26.2	114	99.7	55.3	174	152.2	84.4	234	204.7	113.4	294	257.1	142.5
55	48.1	26.7	115	100.6	55.8	175	153.1	84.8	235	205.5	113.9	295	258.0	143.0
56	49.0	27.1	116	101.5	56.2	176	153.9	85.3	236	206.4	114.4	296	258.9	143.5
57	49.9	27.6	117	102.3	56.7	177	154.8	85.8	237	207.3	114.9	297	259.8	144.0
58	50.7	28.1	118	103.2	57.2	178	155.7	86.3	238	208.2	115.4	298	260.6	144.5
59	51.6	28.6	119	104.1	57.7	179	156.6	86.8	239	209.0	115.9	299	261.5	145.0
60	52.5	29.1	120	105.0	58.2	180	157.4	87.3	240	209.9	116.4	300	262.4	145.4
Diff.	Dep.	Lat.	Diff.	Dep.	Lat.	Diff.	Dep.	Lat.	Diff.	Dep.	Lat.	Diff.	Dep.	Lat.

for 61 Degrees.

Difference of Latitude and Departure for 30 Degrees.

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	00.9	00.5	61	52.8	30.5	121	104.8	60.5	181	156.7	90.5	241	208.7	120.5
2	01.7	01.0	62	53.7	31.0	122	105.7	61.0	182	157.6	91.0	242	209.6	121.0
3	02.6	01.5	63	54.6	31.5	123	106.5	61.5	183	158.5	91.5	243	210.4	121.5
4	03.5	02.0	64	55.4	32.0	124	107.4	62.0	184	159.3	92.0	244	211.3	122.0
5	04.3	02.5	65	56.3	32.5	125	108.3	62.5	185	160.2	92.5	245	212.2	122.5
6	05.2	03.0	66	57.2	33.0	126	109.1	63.0	186	161.1	93.0	246	213.0	123.0
7	06.1	03.5	67	58.0	33.5	127	110.0	63.5	187	161.9	93.5	247	213.9	123.5
8	06.9	04.0	68	58.9	34.0	128	110.8	64.0	188	162.8	94.0	248	214.8	124.0
9	07.8	04.5	69	59.8	34.5	129	111.7	64.5	189	163.7	94.5	249	215.6	124.5
10	08.7	05.0	70	60.6	35.0	130	112.6	65.0	190	164.5	95.0	250	216.5	125.0
11	09.5	05.5	71	61.5	35.5	131	113.4	65.5	191	165.4	95.5	251	217.4	125.5
12	10.4	06.0	72	62.4	36.0	132	114.3	66.0	192	166.3	96.0	252	218.2	126.0
13	11.3	06.5	73	63.2	36.5	133	115.2	66.5	193	167.1	96.5	253	219.1	126.5
14	12.1	07.0	74	64.1	37.0	134	116.0	67.0	194	168.0	97.0	254	220.0	127.0
15	13.0	07.5	75	65.0	37.5	135	116.9	67.5	195	168.9	97.5	255	220.8	127.5
16	13.9	08.0	76	65.8	38.0	136	117.8	68.0	196	169.7	98.0	256	221.7	128.0
17	14.7	08.5	77	66.7	38.5	137	118.6	68.5	197	170.6	98.5	257	222.6	128.5
18	15.6	09.0	78	67.5	39.0	138	119.5	69.0	198	171.5	99.0	258	223.4	129.0
19	16.5	09.5	79	68.4	39.5	139	120.4	69.5	199	172.3	99.5	259	224.3	129.5
20	17.3	10.0	80	69.3	40.0	140	121.2	70.0	200	173.2	100.0	260	225.2	130.0
21	18.2	10.5	81	70.1	40.5	141	122.1	70.5	201	174.1	100.5	261	226.0	130.5
22	19.1	11.0	82	71.0	41.0	142	123.0	71.0	202	174.9	101.0	262	226.9	131.0
23	19.9	11.5	83	71.9	41.5	143	123.8	71.5	203	175.8	101.5	263	227.8	131.5
24	20.8	12.0	84	72.7	42.0	144	124.7	72.0	204	176.7	102.0	264	228.6	132.0
25	21.7	12.5	85	73.6	42.5	145	125.6	72.5	205	177.5	102.5	265	229.5	132.5
26	22.5	13.0	86	74.5	43.0	146	126.4	73.0	206	178.4	103.0	266	230.4	133.0
27	23.4	13.5	87	75.3	43.5	147	127.3	73.5	207	179.3	103.5	267	231.2	133.5
28	24.2	14.0	88	76.2	44.0	148	128.2	74.0	208	180.1	104.0	268	232.1	134.0
29	25.1	14.5	89	77.1	44.5	149	129.0	74.5	209	181.0	104.5	269	233.0	134.5
30	26.0	15.0	90	77.9	45.0	150	129.9	75.0	210	181.9	105.0	270	233.8	135.0
31	26.8	15.5	91	78.8	45.5	151	130.8	75.5	211	182.7	105.5	271	234.7	135.5
32	27.7	16.0	92	79.7	46.0	152	131.7	76.0	212	183.6	106.0	272	235.6	136.0
33	28.6	16.5	93	80.5	46.5	153	132.5	76.5	213	184.5	106.5	273	236.4	136.5
34	29.4	17.0	94	81.4	47.0	154	133.4	77.0	214	185.3	107.0	274	237.3	137.0
35	30.3	17.5	95	82.3	47.5	155	134.2	77.5	215	186.2	107.5	275	238.2	137.5
36	31.2	18.0	96	83.1	48.0	156	135.1	78.0	216	187.1	108.0	276	239.0	138.0
37	32.0	18.5	97	84.0	48.5	157	136.0	78.5	217	187.9	108.5	277	239.9	138.5
38	32.9	19.0	98	84.9	49.0	158	136.8	79.0	218	188.8	109.0	278	240.7	139.0
39	33.8	19.5	99	85.7	49.5	159	137.7	79.5	219	189.7	109.5	279	241.6	139.5
40	34.6	20.0	100	86.6	50.0	160	138.6	80.0	220	190.5	110.0	280	242.5	140.0
41	35.5	20.5	101	87.5	50.5	161	139.4	80.5	221	191.4	110.5	281	243.3	140.5
42	36.4	21.0	102	88.3	51.0	162	140.3	81.0	222	192.3	111.0	282	244.2	141.0
43	37.2	21.5	103	89.2	51.5	163	141.2	81.5	223	193.1	111.5	283	245.1	141.5
44	38.1	22.0	104	90.1	52.0	164	142.0	82.0	224	194.0	112.0	284	245.9	142.0
45	39.0	22.5	105	90.9	52.5	165	142.9	82.5	225	194.9	112.5	285	246.8	142.5
46	39.8	23.0	106	91.8	53.0	166	143.8	83.0	226	195.7	113.0	286	247.7	143.0
47	40.7	23.5	107	92.7	53.5	167	144.6	83.5	227	196.6	113.5	287	248.5	143.5
48	41.5	24.0	108	93.5	54.0	168	145.5	84.0	228	197.4	114.0	288	247.4	144.0
49	42.4	24.5	109	94.4	54.5	169	146.4	84.5	229	198.3	114.5	289	250.3	144.5
50	43.3	25.0	110	95.3	55.0	170	147.2	85.0	230	199.2	115.0	290	251.1	145.0
51	44.2	25.5	111	96.1	55.5	171	148.1	85.5	231	200.0	115.5	291	252.0	145.5
52	45.0	26.0	112	97.0	56.0	172	149.0	86.0	232	200.9	116.0	292	252.9	146.0
53	45.9	26.5	113	97.9	56.5	173	149.8	86.5	233	201.8	116.5	293	253.7	146.5
54	46.8	27.0	114	98.7	57.0	174	150.7	87.0	234	202.6	117.0	294	254.6	147.0
55	47.6	27.5	115	99.6	57.5	175	151.6	87.5	235	203.5	117.5	295	255.5	147.5
56	48.5	28.0	116	100.5	58.0	176	152.4	88.0	236	204.4	118.0	296	256.3	148.0
57	49.4	28.5	117	101.3	58.5	177	153.3	88.5	237	205.2	118.5	297	257.2	148.5
58	50.2	29.0	118	102.2	59.0	178	154.1	89.0	238	206.1	119.0	298	258.1	149.0
59	51.1	29.5	119	103.1	59.5	179	155.0	89.5	239	207.0	119.5	299	258.9	149.5
60	52.0	30.0	120	103.9	60.0	180	155.9	90.0	240	207.8	120.0	300	259.8	150.0
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

For 60 Degrees.

Difference of Latitude and Departure for 31 Degrees.

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	00.9	00.5	61	52.3	31.4	121	103.7	62.3	181	155.1	93.2	241	206.5	124.1
2	01.7	01.0	62	53.1	31.9	122	104.6	62.8	182	156.0	93.7	242	207.4	124.6
3	02.6	01.5	63	54.0	32.4	123	105.4	63.3	183	156.8	94.2	243	208.3	125.1
4	03.4	02.1	64	54.8	33.0	124	106.3	63.9	184	157.7	94.8	244	209.1	125.7
5	04.3	02.6	65	55.7	33.5	125	107.1	64.4	185	158.5	95.3	245	210.0	126.2
6	05.1	03.1	66	56.6	34.0	126	108.0	64.9	186	159.4	95.8	246	210.8	126.7
7	06.0	03.6	67	57.4	34.5	127	108.8	65.4	187	160.3	96.3	247	211.7	127.2
8	06.9	04.1	68	58.3	35.0	128	109.7	65.9	188	161.1	96.8	248	212.5	127.7
9	07.7	04.6	69	59.1	35.5	129	110.6	66.4	189	162.0	97.3	249	213.4	128.2
10	08.6	05.2	70	60.0	36.1	130	111.4	67.0	190	162.8	97.9	250	214.3	128.8
11	09.4	05.7	71	60.8	36.6	131	112.3	67.5	191	163.7	98.4	251	215.1	129.3
12	10.3	06.2	72	61.7	37.1	132	113.1	68.0	192	164.5	98.9	252	216.0	129.8
13	11.1	06.7	73	62.6	37.6	133	114.0	68.5	193	165.4	99.4	253	216.8	130.3
14	12.0	07.2	74	63.4	38.1	134	114.8	69.0	194	166.3	99.9	254	217.7	130.8
15	12.9	07.7	75	64.3	38.6	135	115.7	69.5	195	167.1	100.4	255	218.5	131.3
16	13.7	08.2	76	65.1	39.1	136	116.6	70.0	196	168.0	100.9	256	219.4	131.8
17	14.6	08.8	77	66.0	39.7	137	117.4	70.6	197	168.8	101.5	257	220.2	132.4
18	15.4	09.3	78	66.8	40.2	138	118.3	71.1	198	169.7	102.0	258	221.1	132.9
19	16.3	09.8	79	67.7	40.7	139	119.1	71.6	199	170.5	102.5	259	222.0	133.4
20	17.1	10.3	80	68.6	41.2	140	120.0	72.1	200	171.4	103.0	260	222.8	133.9
21	18.0	10.8	81	69.4	41.7	141	120.8	72.6	201	172.3	103.5	261	223.7	134.4
22	18.9	11.3	82	70.3	42.2	142	121.7	73.1	202	173.1	104.0	262	224.5	134.9
23	19.7	11.8	83	71.1	42.7	143	122.6	73.6	203	174.0	104.5	263	225.4	135.4
24	20.6	12.4	84	72.0	43.3	144	123.4	74.2	204	174.8	105.1	264	226.2	136.0
25	21.4	12.9	85	72.8	43.8	145	124.3	74.7	205	175.7	105.6	265	227.1	136.5
26	22.3	13.4	86	73.7	44.3	146	125.1	75.2	206	176.5	106.1	266	228.0	137.0
27	23.1	13.9	87	74.6	44.8	147	126.0	75.7	207	177.4	106.6	267	228.8	137.5
28	24.0	14.4	88	75.4	45.3	148	126.8	76.2	208	178.3	107.1	268	229.7	138.0
29	24.9	14.9	89	76.3	45.8	149	127.7	76.7	209	179.1	107.6	269	230.5	138.5
30	25.7	15.5	90	77.1	46.4	150	128.6	77.3	210	180.0	108.2	270	231.4	139.1
31	26.6	16.0	91	78.0	46.9	151	129.4	77.8	211	180.8	108.7	271	232.2	139.6
32	27.4	16.5	92	78.8	47.4	152	130.3	78.3	212	181.7	109.2	272	233.1	140.1
33	28.3	17.0	93	79.7	47.9	153	131.1	78.8	213	182.5	109.7	273	234.0	140.6
34	29.1	17.5	94	80.6	48.4	154	132.0	79.3	214	183.4	110.2	274	234.8	141.1
35	30.0	18.0	95	81.4	48.9	155	132.8	79.8	215	184.3	110.7	275	235.7	141.6
36	30.9	18.5	96	82.3	49.4	156	133.7	80.3	216	185.1	111.2	276	236.5	142.1
37	31.7	19.1	97	83.1	50.0	157	134.5	80.9	217	186.0	111.8	277	237.4	142.7
38	32.6	19.6	98	84.0	50.5	158	135.4	81.4	218	186.8	112.3	278	238.2	143.2
39	33.4	20.1	99	84.8	51.0	159	136.3	81.9	219	187.7	112.8	279	239.1	143.7
40	34.3	20.6	100	85.7	51.5	160	137.1	82.4	220	188.5	113.3	280	240.0	144.2
41	35.1	21.1	101	86.6	52.0	161	138.0	82.9	221	189.4	113.8	281	240.8	144.7
42	36.0	21.6	102	87.4	52.5	162	138.8	83.4	222	190.3	114.3	282	241.7	145.2
43	36.9	22.1	103	88.3	53.0	163	139.7	83.9	223	191.1	114.8	283	242.5	145.7
44	37.7	22.6	104	89.1	53.6	164	140.5	84.5	224	192.0	115.4	284	243.4	146.3
45	38.6	23.2	105	90.0	54.1	165	141.4	85.0	225	192.8	115.9	285	244.2	146.8
46	39.4	23.7	106	90.8	54.6	166	142.3	85.5	226	193.7	116.4	286	245.1	147.3
47	40.3	24.2	107	91.7	55.1	167	143.1	86.0	227	194.5	116.9	287	246.0	147.8
48	41.1	24.7	108	92.6	55.6	168	144.0	86.5	228	195.4	117.4	288	246.8	148.3
49	42.0	25.2	109	93.4	56.1	169	144.8	87.0	229	196.3	117.9	289	247.7	148.8
50	42.9	25.8	110	94.3	56.7	170	145.7	87.6	230	197.1	118.5	290	248.5	149.4
51	43.7	26.3	111	95.1	57.2	171	146.5	88.1	231	198.0	119.0	291	249.4	149.9
52	44.6	26.8	112	96.0	57.7	172	147.4	88.6	232	198.8	119.5	292	250.2	150.4
53	45.4	27.3	113	96.8	58.2	173	148.3	89.1	233	199.7	120.0	293	251.1	150.9
54	46.3	27.8	114	97.7	58.7	174	149.1	89.6	234	200.5	120.5	294	252.0	151.4
55	47.1	28.3	115	98.6	59.2	175	150.0	90.1	235	201.4	121.0	295	252.8	151.9
56	48.0	28.8	116	99.4	59.7	176	150.8	90.6	236	202.3	121.5	296	253.7	152.4
57	48.8	29.4	117	100.3	60.3	177	151.7	91.2	237	203.1	122.1	297	254.5	153.0
58	49.7	29.9	118	101.1	60.8	178	152.5	91.7	238	204.0	122.6	298	255.4	153.5
59	50.6	30.4	119	102.0	61.3	179	153.4	92.2	239	204.8	123.1	299	256.2	154.0
60	51.4	30.9	120	102.8	61.8	180	154.3	92.7	240	205.7	123.6	300	257.1	154.5
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

for 59 Degrees.

Difference of Latitude and Departure for 32 Degrees.

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	00.8	00.5	61	51.7	32.3	121	102.6	64.1	181	153.5	95.9	241	204.4	127.7
2	01.7	01.1	62	52.6	32.9	122	103.5	64.7	182	154.3	96.5	242	205.2	128.3
3	02.5	01.6	63	53.4	33.4	123	104.3	65.2	183	155.2	97.0	243	206.1	128.8
4	03.4	02.1	64	54.3	33.9	124	105.2	65.7	184	156.0	97.5	244	206.9	129.3
5	04.2	02.6	65	55.1	34.5	125	106.0	66.3	185	156.9	98.1	245	207.8	129.9
6	05.1	03.2	66	56.0	35.0	126	106.8	66.8	186	157.7	98.6	246	208.6	130.4
7	05.9	03.7	67	56.8	35.5	127	107.7	67.3	187	158.6	99.1	247	209.5	130.9
8	06.8	04.2	68	57.7	36.0	128	108.5	67.8	188	159.4	99.6	248	210.3	131.4
9	07.6	04.8	69	58.5	36.6	129	109.4	68.4	189	160.3	100.2	249	211.2	132.0
10	08.5	05.3	70	59.4	37.1	130	110.2	68.9	190	161.1	100.7	250	212.0	132.5
11	09.3	05.8	71	60.2	37.6	131	111.1	69.4	191	162.0	101.2	251	212.8	133.0
12	10.2	06.4	72	61.1	38.2	132	111.9	70.0	192	162.8	101.8	252	213.7	133.6
13	11.0	06.9	73	61.9	38.7	133	112.8	70.5	193	163.7	102.3	253	214.5	134.1
14	11.9	07.4	74	62.8	39.2	134	113.6	71.0	194	164.5	102.8	254	215.4	134.6
15	12.7	08.0	75	63.6	39.8	135	114.5	71.6	195	165.4	103.4	255	216.2	135.2
16	13.6	08.5	76	64.4	40.3	136	115.3	72.1	196	166.2	103.9	256	217.1	135.7
17	14.4	09.0	77	65.3	40.8	137	116.2	72.6	197	167.1	104.4	257	217.9	136.2
18	15.3	09.5	78	66.1	41.3	138	117.0	73.1	198	167.9	104.9	258	218.8	136.7
19	16.1	10.1	79	67.0	41.9	139	117.9	73.7	199	168.8	105.5	259	219.6	137.3
20	17.0	10.6	80	67.8	42.4	140	118.8	74.2	200	169.6	106.0	260	220.5	137.8
21	17.8	11.1	81	68.7	42.9	141	119.6	74.7	201	170.4	106.5	261	221.3	138.3
22	18.7	11.7	82	69.5	43.5	142	120.4	75.3	202	171.3	107.1	262	222.2	138.9
23	19.5	12.2	83	70.4	44.0	143	121.3	75.8	203	172.1	107.6	263	223.0	139.4
24	20.4	12.7	84	71.2	44.5	144	122.1	76.3	204	173.0	108.1	264	223.9	139.9
25	21.2	13.3	85	72.1	45.1	145	123.0	76.9	205	173.8	108.7	265	224.7	140.5
26	22.0	13.8	86	72.9	45.6	146	123.8	77.4	206	174.7	109.2	266	225.6	141.0
27	22.9	14.3	87	73.8	46.1	147	124.7	77.9	207	175.5	109.7	267	226.4	141.5
28	23.7	14.8	88	74.6	46.6	148	125.5	78.4	208	176.4	110.2	268	227.3	142.0
29	24.6	15.4	89	75.5	47.2	149	126.4	79.0	209	177.2	110.8	269	228.1	142.6
30	25.4	15.9	90	76.3	47.7	150	127.2	79.5	210	178.1	111.3	270	229.0	143.1
31	26.3	16.4	91	77.2	48.2	151	128.0	80.0	211	178.9	111.8	271	229.8	143.6
32	27.1	17.0	92	78.0	48.8	152	128.9	80.6	212	179.8	112.4	272	230.7	144.2
33	28.0	17.5	93	78.9	49.3	153	129.7	81.1	213	180.5	112.9	273	231.5	144.7
34	28.8	18.0	94	79.7	49.8	154	130.6	81.6	214	181.5	113.4	274	232.4	145.2
35	29.7	18.6	95	80.6	50.4	155	131.4	82.2	215	182.3	114.0	275	233.2	145.8
36	30.5	19.1	96	81.4	50.9	156	132.3	82.7	216	183.2	114.5	276	234.0	146.3
37	31.4	19.6	97	82.3	51.4	157	133.1	83.2	217	184.0	115.0	277	234.9	146.8
38	32.2	20.1	98	83.1	51.9	158	134.0	83.7	218	184.9	115.5	278	235.7	147.3
39	33.1	20.7	99	84.0	52.5	159	134.8	84.3	219	185.7	116.1	279	236.6	147.9
40	33.9	21.2	100	84.8	53.0	160	135.7	84.8	220	186.6	116.6	280	237.4	148.4
41	34.8	21.7	101	85.6	53.5	161	136.5	85.3	221	187.4	117.1	281	238.3	148.9
42	35.6	22.3	102	86.5	54.1	162	137.4	85.9	222	188.3	117.7	282	239.1	149.4
43	36.5	22.8	103	87.3	54.6	163	138.2	86.4	223	189.1	118.2	283	240.0	150.0
44	37.3	23.3	104	88.2	55.1	164	139.1	86.9	224	190.0	118.7	284	240.8	150.5
45	38.2	23.9	105	89.0	55.7	165	139.9	87.5	225	190.8	119.2	285	241.7	151.1
46	39.0	24.4	106	89.9	56.2	166	140.8	88.0	226	191.6	119.8	286	242.5	151.6
47	39.9	24.9	107	90.7	56.7	167	141.6	88.5	227	192.5	120.3	287	243.4	152.1
48	40.7	25.4	108	91.6	57.2	168	142.5	89.0	228	193.3	120.8	288	244.2	152.6
49	41.6	26.0	109	92.4	57.8	169	143.3	89.6	229	194.2	121.4	289	245.1	153.2
50	42.4	26.5	110	93.3	58.3	170	144.2	90.1	230	195.0	121.9	290	245.9	153.7
51	43.2	27.0	111	94.1	58.8	171	145.0	90.6	231	195.9	122.4	291	246.8	154.2
52	44.1	27.6	112	95.0	59.4	172	145.9	91.2	232	196.7	123.0	292	247.6	154.8
53	44.9	28.1	113	95.8	59.9	173	146.7	91.7	233	197.6	123.5	293	248.5	155.3
54	45.8	28.6	114	96.7	60.0	174	147.6	92.2	234	198.4	124.0	294	249.3	155.8
55	46.6	29.2	115	97.5	61.0	175	148.4	92.8	235	199.3	124.5	295	250.2	156.4
56	47.5	29.7	116	98.4	61.5	176	149.2	93.3	236	200.1	125.1	296	251.0	156.9
57	48.3	30.2	117	99.2	62.0	177	150.1	93.8	237	201.0	125.6	297	251.9	157.4
58	49.2	30.7	118	100.1	62.5	178	150.9	94.3	238	201.8	126.1	298	252.7	157.9
59	50.0	31.3	119	100.9	63.1	179	151.8	94.9	239	202.7	126.7	299	253.6	158.5
60	50.9	31.8	120	101.8	63.6	180	152.6	95.4	240	203.5	127.2	300	254.4	159.0
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

for 58 Degrees.

Difference of Latitude and Departure for 31 Degrees.

Dist.	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.9	00.5	61	52.3	31.4	121	103.7	62.3	181	155.1	93.2	241	206.5	124.1
2	01.7	01.0	62	53.1	31.9	122	104.6	62.8	182	156.0	93.7	242	207.4	124.6
3	02.6	01.5	63	54.0	32.4	123	105.4	63.3	183	156.8	94.2	243	208.3	125.1
4	03.4	02.1	64	54.8	33.0	124	106.3	63.9	184	157.7	94.8	244	209.1	125.6
5	04.3	02.6	65	55.7	33.5	125	107.1	64.4	185	158.5	95.3	245	210.0	126.2
6	05.1	03.1	66	56.6	34.0	126	108.0	64.9	186	159.4	95.8	246	210.8	126.7
7	06.0	03.6	67	57.4	34.5	127	108.8	65.4	187	160.3	96.3	247	211.7	127.2
8	06.9	04.1	68	58.3	35.0	128	109.7	65.9	188	161.1	96.8	248	212.5	127.7
9	07.7	04.6	69	59.1	35.5	129	110.6	66.4	189	162.0	97.3	249	213.4	128.2
10	08.6	05.2	70	60.0	36.1	130	111.4	67.0	190	162.8	97.9	250	214.3	128.8
11	09.4	05.7	71	60.8	36.6	131	112.3	67.5	191	163.7	98.4	251	215.1	129.3
12	10.3	06.2	72	61.7	37.1	132	113.1	68.0	192	164.5	98.9	252	216.0	129.8
13	11.1	06.7	73	62.6	37.6	133	114.0	68.5	193	165.4	99.4	253	216.8	130.3
14	12.0	07.2	74	63.4	38.1	134	114.8	69.0	194	166.3	99.9	254	217.7	130.8
15	13.9	07.7	75	64.3	38.6	135	115.7	69.5	195	167.1	100.4	255	218.5	131.3
16	13.7	08.2	76	65.1	39.1	136	116.6	70.0	196	168.0	100.9	256	219.4	131.8
17	14.6	08.8	77	66.0	39.7	137	117.4	70.6	197	168.8	101.5	257	220.2	132.4
18	15.4	09.3	78	66.8	40.2	138	118.3	71.1	198	169.7	102.0	258	221.1	132.9
19	16.3	09.8	79	67.7	40.7	139	119.1	71.6	199	170.5	102.5	259	222.0	133.4
20	17.1	10.3	80	68.6	41.2	140	120.0	72.1	200	171.4	103.0	260	222.8	133.9
21	18.0	10.8	81	69.4	41.7	141	120.8	72.6	201	172.3	103.5	261	223.7	134.4
22	18.9	11.3	82	70.3	42.2	142	121.7	73.1	202	173.1	104.0	262	224.5	134.9
23	19.7	11.8	83	71.1	42.7	143	122.6	73.6	203	174.0	104.5	263	225.4	135.4
24	20.6	12.4	84	72.0	43.3	144	123.4	74.2	204	174.8	105.1	264	226.2	136.0
25	21.4	12.9	85	72.8	43.8	145	124.3	74.7	205	175.7	105.6	265	227.1	136.5
26	22.3	13.4	86	73.7	44.3	146	125.1	75.2	206	176.5	106.1	266	228.0	137.0
27	23.1	13.9	87	74.6	44.8	147	126.0	75.7	207	177.4	106.6	267	228.8	137.5
28	24.0	14.4	88	75.4	45.3	148	126.8	76.2	208	178.3	107.1	268	229.7	138.0
29	24.9	14.9	89	76.3	45.8	149	127.7	76.7	209	179.1	107.6	269	230.5	138.5
30	25.7	15.5	90	77.1	46.4	150	128.6	77.3	210	180.0	108.2	270	231.4	139.1
31	26.6	16.0	91	78.0	46.9	151	129.4	77.8	211	180.8	108.7	271	232.2	13.96
32	27.4	16.5	92	78.8	47.4	152	130.3	78.3	212	181.7	109.2	272	233.1	140.1
33	28.3	17.0	93	79.7	47.9	153	131.1	78.8	213	182.5	109.7	273	234.0	140.6
34	29.1	17.5	94	80.6	48.4	154	132.0	79.3	214	183.4	110.2	274	234.8	141.1
35	30.0	18.0	95	81.4	48.9	155	132.8	79.8	215	184.3	110.7	275	235.7	141.6
36	30.9	18.5	96	82.3	49.4	156	133.7	80.3	216	185.1	111.2	276	236.5	142.1
37	31.7	19.1	97	83.1	50.0	157	134.5	80.9	217	186.0	111.8	277	237.4	142.7
38	32.6	19.6	98	84.0	50.5	158	135.4	81.4	218	186.8	112.3	278	238.2	143.2
39	33.4	20.1	99	84.8	51.0	159	136.3	81.9	219	187.7	112.8	279	239.1	143.7
40	34.3	20.6	100	85.7	51.5	160	137.1	82.4	220	188.5	113.3	280	240.0	144.2
41	35.1	21.1	101	86.6	52.0	161	138.0	82.9	221	189.4	113.8	281	240.8	144.7
42	36.0	21.6	102	87.4	52.5	162	138.8	83.4	222	190.3	114.3	282	241.7	145.2
43	36.9	22.1	103	88.3	53.0	163	139.7	83.9	223	191.1	114.8	283	242.5	145.7
44	37.7	22.6	104	89.1	53.6	164	140.5	84.5	224	192.0	115.4	284	243.4	146.3
45	38.6	23.2	105	90.0	54.1	165	141.4	85.0	225	192.8	115.9	285	244.2	146.8
46	39.4	23.7	106	90.8	54.6	166	142.3	85.5	226	193.7	116.4	286	245.1	147.3
47	40.3	24.2	107	91.7	55.1	167	143.1	86.0	227	194.5	116.9	287	246.0	147.8
48	41.1	24.7	108	92.6	55.6	168	144.0	86.5	228	195.4	117.4	288	246.8	148.3
49	42.0	25.2	109	93.4	56.1	169	144.8	87.0	229	196.3	117.9	289	247.7	148.8
50	42.9	25.8	110	94.3	56.7	170	145.7	87.6	230	197.1	118.5	290	248.5	149.4
51	43.7	26.3	111	95.1	57.2	171	146.5	88.1	231	198.0	119.0	291	249.4	149.4
52	44.6	26.8	112	96.0	57.7	172	147.4	88.6	232	198.8	119.5	292	250.2	150.4
53	45.4	27.3	113	96.8	58.2	173	148.3	89.1	233	199.7	120.0	293	251.1	150.9
54	46.3	27.8	114	97.7	58.7	174	149.1	89.6	234	200.5	120.5	294	252.0	151.4
55	47.1	28.3	115	98.6	59.2	175	150.0	90.1	235	201.4	121.0	295	252.8	151.9
56	48.0	28.8	116	99.4	59.7	176	150.8	90.6	236	202.3	121.5	296	253.7	152.4
57	48.8	29.4	117	100.3	60.3	177	151.7	91.2	237	203.1	122.1	297	254.5	153.0
58	49.7	29.9	118	101.1	60.8	178	152.5	91.7	238	204.0	122.6	298	255.4	153.5
59	50.6	30.4	119	102.0	61.3	179	153.4	92.2	239	204.8	123.1	299	256.2	154.0
60	51.4	30.9	120	102.8	61.8	180	154.3	92.7	240	205.7	123.6	300	257.1	154.5
Dist.	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 59 Degrees.

Difference of Latitude and Departure for 32 Degrees.

Dift.	Lat.	Dep.	Dift	Lat.	Dep.	Dift	Lat.	Dep.	Dift	Lat.	Dep.	Dift	Lat.	Dep.
1	00.8	00.5	61	51.7	32.3	121	102.6	64.1	181	153.5	95.9	241	204.4	127.7
2	01.7	01.1	62	52.6	32.9	122	103.5	64.7	182	154.3	96.5	242	205.2	128.3
3	02.5	01.6	63	53.4	33.4	123	104.3	65.2	183	155.2	97.0	243	206.1	128.8
4	03.4	02.1	64	54.3	33.9	124	105.2	65.7	184	156.0	97.5	244	206.9	129.3
5	04.2	02.6	65	55.1	34.5	125	106.0	66.2	185	156.9	98.1	245	207.8	129.9
6	05.1	03.2	66	56.0	35.0	126	106.8	66.8	186	157.7	98.6	246	208.6	130.4
7	05.9	03.7	67	56.8	35.5	127	107.7	67.3	187	158.6	99.1	247	209.5	130.9
8	06.8	04.2	68	57.7	36.0	128	108.5	67.8	188	159.4	99.6	248	210.3	131.4
9	07.6	04.8	69	58.5	36.6	129	109.4	68.4	189	160.3	100.2	249	211.2	132.0
10	08.5	05.3	70	59.4	37.1	130	110.2	68.9	190	161.1	100.7	250	212.0	132.5
11	09.3	05.8	71	60.2	37.6	131	111.1	69.4	191	162.0	101.2	251	212.8	133.0
12	10.2	06.4	72	61.1	38.2	132	111.9	70.0	192	162.8	101.8	252	213.7	133.6
13	11.0	06.9	73	61.9	38.7	133	112.8	70.5	193	163.7	102.3	253	214.5	134.1
14	11.9	07.4	74	62.8	39.2	134	113.6	71.0	194	164.5	102.8	254	215.4	134.6
15	12.7	08.0	75	63.6	39.8	135	114.5	71.6	195	165.4	103.4	255	216.2	135.2
16	13.6	08.5	76	64.4	40.3	136	115.3	72.1	196	166.2	103.9	256	217.1	135.7
17	14.4	09.0	77	65.3	40.8	137	116.2	72.6	197	167.1	104.4	257	217.9	136.2
18	15.3	09.5	78	66.1	41.3	148	117.0	73.1	198	167.9	104.9	258	218.8	136.7
19	16.1	10.1	79	67.0	41.9	139	117.9	73.7	199	168.8	105.5	259	219.6	137.3
20	17.0	10.6	80	67.8	42.4	140	118.8	74.2	200	169.6	106.0	260	220.5	137.8
21	17.8	11.1	81	68.7	42.9	141	119.6	74.7	201	170.4	106.5	261	221.3	138.3
22	18.7	11.7	82	69.5	43.5	142	120.4	75.3	202	171.3	107.1	262	222.2	138.9
23	19.5	12.2	83	70.4	44.0	143	121.3	75.8	203	172.1	107.6	263	223.0	139.4
24	20.4	12.7	84	71.2	44.5	144	122.1	76.3	204	173.0	108.1	264	223.9	139.9
25	21.2	13.3	85	72.1	45.1	145	123.0	76.9	205	173.8	108.7	265	224.7	140.5
26	22.0	13.8	86	72.9	45.6	146	123.8	77.4	206	174.7	109.2	266	225.6	141.0
27	22.9	14.3	87	73.8	46.1	147	124.7	77.9	207	175.5	109.7	267	226.4	141.5
28	23.7	14.8	88	74.6	46.6	148	125.5	78.4	208	176.4	110.2	268	227.3	142.0
29	24.6	15.4	89	75.5	47.2	149	126.4	79.0	209	177.2	110.8	269	228.1	142.6
30	25.4	15.9	90	76.3	47.7	150	127.2	79.5	210	178.1	111.3	270	229.0	143.1
31	26.3	16.4	91	77.2	48.2	151	128.0	80.0	211	178.9	111.8	271	229.8	143.6
32	27.1	17.0	92	78.0	48.8	152	128.9	80.6	212	179.8	112.4	272	230.7	144.2
33	28.0	17.5	93	78.9	49.3	153	129.7	81.1	213	180.5	112.9	273	231.5	144.7
34	28.8	18.0	94	79.7	49.8	154	130.6	81.6	214	181.5	113.4	274	232.4	145.2
35	29.7	18.6	95	80.6	50.4	155	131.4	82.2	215	182.3	114.0	275	233.2	145.8
36	30.5	19.1	96	81.4	50.9	156	132.3	82.7	216	183.2	114.5	276	234.0	146.3
37	31.4	19.6	97	82.3	51.4	157	133.1	83.2	217	184.0	115.0	277	234.9	146.
38	32.2	20.1	98	83.1	51.9	158	134.0	83.7	218	184.9	115.5	278	235.7	147.3
39	33.1	20.7	99	84.0	52.5	159	134.8	84.3	219	185.7	116.1	279	236.6	147.9
40	33.9	21.2	100	84.8	53.0	160	135.7	84.8	220	186.6	116.6	280	237.4	148.4
41	34.8	21.7	101	85.6	53.5	161	136.5	85.3	221	187.4	117.1	281	238.3	148.9
42	35.6	22.3	102	86.5	54.1	162	137.4	85.9	222	188.3	117.7	282	239.1	149.5
43	36.5	22.8	103	87.3	54.6	163	138.2	86.4	223	189.1	118.2	283	240.0	150.0
44	37.3	23.3	104	88.2	55.1	164	139.1	86.9	224	190.0	118.7	284	240.8	150.5
45	38.2	23.9	105	89.0	55.7	165	139.9	87.5	225	190.8	119.2	285	241.7	151.1
46	39.0	24.4	106	89.9	56.2	166	140.8	88.0	226	191.6	119.8	286	242.5	151.6
47	39.9	24.9	107	90.7	56.7	167	141.6	88.5	227	192.5	120.3	287	243.4	152.1
48	40.7	25.4	108	91.6	57.2	168	142.5	89.0	228	193.3	120.8	288	244.2	152.6
49	41.6	26.0	109	92.4	57.8	169	143.3	89.6	229	194.2	121.4	289	245.1	153.2
50	42.4	26.5	110	93.3	58.3	170	144.2	90.1	230	195.0	121.9	290	245.9	153.7
51	43.2	27.0	111	94.1	58.8	171	145.0	90.6	231	195.9	122.4	291	246.8	154.2
52	44.1	27.6	112	95.0	59.4	172	145.9	91.2	232	196.7	123.0	292	247.6	154.8
53	44.9	28.1	113	95.8	59.9	173	146.7	91.7	233	197.6	123.5	293	248.5	155.3
54	45.8	28.6	114	96.7	60.4	174	147.6	92.2	234	198.4	124.0	294	249.3	155.8
55	46.6	29.2	115	97.5	61.0	175	148.4	92.8	235	199.3	124.6	295	250.2	156.4
56	47.5	29.7	116	98.4	61.5	176	149.2	93.3	236	200.1	125.1	296	251.0	156.9
57	48.3	30.2	117	99.2	62.0	177	150.1	93.8	237	201.0	125.6	297	251.9	157.4
58	49.2	30.7	118	100.1	62.5	178	150.9	94.3	238	201.8	126.1	298	252.7	157.9
59	50.0	31.3	119	100.9	63.1	179	151.8	94.9	239	202.7	126.7	299	253.6	158.5
60	50.9	31.8	120	101.8	63.6	180	152.6	95.4	240	203.5	127.2	300	254.4	159.0
Dift	Dep.	Lat.	Dift	Dep.	Lat.	Dift	Dep.	Lat.	Dift	Dep.	Lat.	Dift	Dep.	Lat.

for 58 Degrees.

Difference of Latitude and Departure for 33 Degrees.

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	00.8	00.5	61	51.2	33.2	121	101.5	65.9	241	151.8	98.6	241	202.1	131.2
2	01.7	01.1	62	52.0	33.8	122	102.3	66.4	242	152.6	99.1	242	202.9	131.8
3	02.5	01.6	63	52.8	34.3	123	103.2	67.0	243	153.5	99.7	243	203.8	132.3
4	03.4	02.2	64	53.7	34.9	124	104.0	67.5	244	154.3	100.2	244	204.6	132.9
5	04.2	02.7	65	54.5	35.4	125	104.8	68.1	245	155.1	100.8	245	205.5	133.4
6	05.0	03.3	66	55.3	35.9	126	105.7	68.6	246	156.0	101.3	246	206.3	134.0
7	05.9	03.8	67	56.2	36.5	127	106.5	69.2	247	156.8	101.8	247	207.1	134.5
8	06.7	04.4	68	57.0	37.0	128	107.3	69.7	248	157.7	102.4	248	208.0	135.1
9	07.5	04.9	69	57.9	37.6	129	108.2	70.3	249	158.5	102.9	249	208.8	135.6
10	08.4	05.4	70	58.7	38.1	130	109.0	70.8	250	159.3	103.5	250	209.7	136.2
11	09.2	06.0	71	59.5	38.7	131	109.9	71.3	251	160.2	104.0	251	210.5	136.7
12	10.1	06.5	72	60.4	39.2	132	110.7	71.9	252	161.0	104.6	252	211.3	137.2
13	10.9	07.1	73	61.2	39.8	133	111.5	72.4	253	161.8	105.1	253	212.2	137.8
14	11.7	07.6	74	62.1	40.3	134	112.4	73.0	254	162.7	105.7	254	213.0	138.2
15	12.6	08.2	75	62.9	40.8	135	113.2	73.5	255	163.5	106.2	255	213.8	138.9
16	13.4	08.7	76	63.7	41.4	136	114.0	74.1	256	164.4	106.7	256	214.7	139.4
17	14.3	09.3	77	64.6	41.9	137	114.9	74.6	257	165.2	107.3	257	215.5	140.0
18	15.1	09.8	78	65.4	42.5	138	115.7	75.2	258	166.0	107.8	258	216.4	140.5
19	15.9	10.3	79	66.2	43.0	139	116.6	75.7	259	166.9	108.4	259	217.2	141.1
20	16.8	10.9	80	67.1	43.6	140	117.4	76.2	260	167.7	108.9	260	218.0	141.6
21	17.6	11.4	81	67.9	44.1	141	118.2	76.8	261	168.6	109.5	261	218.9	142.1
22	18.4	12.0	82	68.8	44.7	142	119.1	77.3	262	169.4	110.0	262	219.7	142.7
23	19.3	12.5	83	69.6	45.2	143	119.9	77.9	263	170.2	110.6	263	220.6	143.2
24	20.1	13.1	84	70.4	45.7	144	120.8	78.4	264	171.1	111.1	264	221.4	143.8
25	21.0	13.6	85	71.3	46.3	145	121.6	79.0	265	171.9	111.6	265	222.2	144.3
26	21.8	14.2	86	72.1	46.8	146	122.4	79.5	266	172.8	112.2	266	223.1	144.9
27	22.6	14.7	87	73.0	47.4	147	123.3	80.1	267	173.6	112.7	267	223.9	145.4
28	23.5	15.2	88	73.8	47.9	148	124.1	80.6	268	174.4	113.3	268	224.7	146.0
29	24.3	15.8	89	74.6	48.5	149	125.0	81.1	269	175.3	113.8	269	225.6	146.5
30	25.2	16.3	90	75.5	49.0	150	125.8	81.7	270	176.1	114.4	270	226.4	147.0
31	26.0	16.9	91	76.3	49.6	151	126.6	82.2	271	176.9	114.9	271	227.3	147.6
32	26.8	17.4	92	77.2	50.1	152	127.5	82.8	272	177.8	115.5	272	228.1	148.1
33	27.7	18.0	93	78.0	50.6	153	128.3	83.3	273	178.6	116.0	273	228.9	148.7
34	28.5	18.5	94	78.8	51.2	154	129.1	83.9	274	179.5	116.5	274	229.8	149.2
35	29.4	19.1	95	79.7	51.7	155	130.0	84.4	275	180.3	117.1	275	230.6	149.8
36	30.2	19.6	96	80.5	52.3	156	130.8	85.0	276	181.1	117.6	276	231.5	150.3
37	31.0	20.2	97	81.3	52.8	157	131.7	85.5	277	182.0	118.2	277	232.3	150.9
38	31.9	20.7	98	82.2	53.4	158	132.5	86.0	278	182.8	118.7	278	233.1	151.4
39	32.7	21.2	99	83.0	53.9	159	133.3	86.6	279	183.7	119.3	279	234.0	151.9
40	33.5	21.8	100	83.9	54.5	160	134.2	87.1	280	184.5	119.8	280	234.8	152.5
41	34.4	22.3	101	84.7	55.0	161	135.0	87.7	281	185.3	120.4	281	235.6	153.0
42	35.2	22.9	102	85.5	55.5	162	135.9	88.2	282	186.2	120.9	282	236.5	153.6
43	36.1	23.4	103	86.4	56.1	163	136.7	88.8	283	187.0	121.4	283	237.3	154.1
44	36.9	24.0	104	87.2	56.6	164	137.5	89.3	284	187.8	122.0	284	238.2	154.7
45	37.7	24.5	105	88.1	57.2	165	138.4	89.9	285	188.7	122.5	285	239.0	155.2
46	38.6	25.1	106	88.9	57.7	166	139.2	90.4	286	189.5	123.1	285	239.8	155.8
47	39.4	25.6	107	89.7	58.3	167	140.0	90.9	287	190.4	123.6	287	240.7	156.3
48	40.3	26.1	108	90.6	58.8	168	140.9	91.5	288	191.2	124.2	288	241.5	156.8
49	41.1	26.7	109	91.4	59.4	169	141.7	92.0	289	192.0	124.7	289	242.4	157.4
50	41.9	27.2	110	92.2	59.9	170	142.6	92.6	290	192.9	125.3	290	243.2	157.9
51	42.8	27.8	111	93.1	60.5	171	143.4	93.1	291	193.7	125.8	291	244.0	158.5
52	43.6	28.3	112	93.9	61.0	172	144.2	93.7	292	194.6	126.3	292	244.9	159.0
53	44.4	28.9	113	94.8	61.5	173	145.1	94.2	293	195.4	126.9	293	245.7	159.6
54	45.3	29.4	114	95.6	62.1	174	145.9	94.8	294	196.2	127.4	294	246.5	160.1
55	46.1	30.0	115	96.4	62.6	175	146.8	95.3	295	197.1	128.0	295	247.4	160.7
56	47.0	30.5	116	97.3	63.2	176	147.6	95.8	296	197.9	128.5	296	248.2	161.2
57	47.8	31.0	117	98.1	63.7	177	148.4	96.4	297	198.7	129.1	297	249.1	161.7
58	48.6	31.6	118	99.0	64.3	178	149.3	96.9	298	199.6	129.6	298	249.9	162.3
59	49.5	32.1	119	99.8	64.8	179	150.1	97.5	299	200.4	130.2	299	250.7	162.8
60	50.3	32.7	120	100.6	65.4	180	150.9	98.0	300	201.3	130.7	300	251.6	163.4
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

for 57 Degrees.

Difference of Latitude and Departure for 34 Degrees.

Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.
1	00.8	00.6	61	50.6	34.1	121	100.3	67.7	181	150.0	101.2	241	199.8	134.8
2	01.7	01.1	62	51.4	34.7	122	101.1	68.2	182	150.9	101.8	242	200.6	135.3
3	02.5	01.7	63	52.2	35.2	123	102.0	68.8	183	151.7	102.3	243	201.4	135.9
4	03.3	02.2	64	53.1	35.8	124	102.8	69.3	184	152.5	102.9	244	202.3	136.4
5	04.1	02.8	65	53.9	36.3	125	103.6	69.9	185	153.4	103.5	245	203.1	137.0
6	05.0	03.4	66	54.7	36.9	126	104.5	70.5	186	154.2	104.0	246	203.9	137.6
7	05.8	03.9	67	55.5	37.5	127	105.3	71.0	187	155.0	104.6	247	204.8	138.1
8	06.6	04.5	68	56.4	38.0	128	106.1	71.6	188	155.9	105.1	248	205.6	138.7
9	07.5	05.0	69	57.2	38.6	129	106.9	72.1	189	156.7	105.7	249	206.4	139.2
10	08.3	05.6	70	58.0	39.1	130	107.8	72.7	190	157.5	106.2	250	207.3	139.8
11	09.1	06.2	71	58.9	39.7	131	108.6	73.3	191	158.3	106.8	251	208.1	140.4
12	09.9	06.7	72	59.7	40.3	132	109.4	73.8	192	159.2	107.4	252	208.9	140.9
13	10.8	07.3	73	60.5	40.8	133	110.3	74.4	193	160.0	107.9	253	209.7	141.5
14	11.6	07.8	74	61.3	41.4	134	111.1	74.9	194	160.8	108.5	254	210.6	142.0
15	12.4	08.4	75	62.2	41.9	135	111.9	75.5	195	161.7	109.0	255	211.4	142.6
16	13.3	08.9	76	63.0	42.5	136	112.7	76.1	196	162.5	109.6	256	212.2	143.2
17	14.1	09.5	77	63.8	43.1	137	113.6	76.6	197	163.3	110.2	257	213.1	143.7
18	14.9	10.1	78	64.7	43.6	138	114.4	77.2	198	164.1	110.7	258	213.9	144.3
19	15.8	10.6	79	65.5	44.2	139	115.2	77.7	199	165.0	111.3	259	214.7	144.8
20	16.6	11.2	80	66.3	44.7	140	116.1	78.3	200	165.8	111.8	260	215.5	145.4
21	17.4	11.7	81	67.1	45.3	141	116.9	78.8	201	166.6	112.4	261	216.4	146.0
22	18.2	12.3	82	68.0	45.9	142	117.7	79.4	202	167.5	113.0	262	217.2	146.5
23	19.1	12.9	83	68.8	46.4	143	118.5	80.0	203	168.3	113.5	263	218.0	147.1
24	19.9	13.4	84	69.6	47.0	144	119.4	80.5	204	169.1	114.1	264	218.9	147.6
25	20.7	14.0	85	70.5	47.5	145	120.2	81.1	205	169.9	114.6	265	219.7	148.2
26	21.6	14.5	86	71.3	48.1	146	121.0	81.6	206	170.8	115.2	266	220.5	148.7
27	22.4	15.1	87	72.1	48.7	147	121.9	82.2	207	171.6	115.8	267	221.3	149.3
28	23.2	15.7	88	73.0	49.2	148	122.7	82.8	208	172.4	116.3	268	222.2	149.9
29	24.0	16.2	89	73.8	49.8	149	123.5	83.3	209	173.3	116.9	269	223.0	150.4
30	24.9	16.8	90	74.6	50.3	150	124.4	83.9	210	174.1	117.4	270	223.8	151.0
31	25.7	17.3	91	75.4	50.9	151	125.2	84.4	211	174.9	118.0	271	224.7	151.5
32	26.5	17.9	92	76.3	51.4	152	126.0	85.0	212	175.7	118.6	272	225.5	152.1
33	27.4	18.5	93	77.1	52.0	153	126.8	85.6	213	176.6	119.1	173	226.3	152.7
34	28.2	19.0	94	77.9	52.6	154	127.7	86.1	214	177.4	119.7	274	227.1	153.2
35	29.0	19.6	95	78.8	53.1	155	128.5	86.7	215	178.2	120.2	275	228.0	153.8
36	29.8	20.1	96	79.6	53.7	156	129.3	87.2	216	179.1	120.8	276	228.8	154.3
37	30.7	20.7	97	80.4	54.2	157	130.2	87.8	217	179.9	121.3	277	229.6	154.9
38	31.5	21.2	98	81.2	54.8	158	131.0	88.4	218	180.7	121.9	278	230.5	155.5
39	32.3	21.8	99	82.1	55.4	159	131.8	88.9	219	181.6	122.5	279	231.3	156.0
40	33.2	22.4	100	82.9	55.9	160	132.6	89.5	220	182.4	123.0	280	232.1	156.6
41	34.0	22.9	101	83.7	56.5	161	133.5	90.0	221	183.2	123.6	281	232.9	157.1
42	34.8	23.5	102	84.6	57.0	162	134.3	90.6	222	184.0	124.1	282	233.8	157.7
43	35.6	24.0	103	85.4	57.6	163	135.1	91.1	223	184.9	124.7	283	234.6	158.3
44	36.5	24.6	104	86.2	58.2	164	136.0	91.7	224	185.7	125.3	284	235.4	158.8
45	37.3	25.2	105	87.0	58.7	165	136.8	92.3	225	186.5	125.8	285	236.3	159.4
46	38.1	25.7	106	87.9	59.3	166	137.6	92.8	226	187.4	126.4	286	237.1	159.9
47	39.0	26.3	107	88.7	59.8	167	138.4	93.4	127	188.2	126.9	287	237.9	160.5
48	39.8	26.8	108	89.5	60.4	168	139.3	93.9	228	189.0	127.5	288	238.8	161.0
49	40.6	27.4	109	90.4	61.0	169	140.1	94.5	229	189.8	128.1	289	239.6	161.6
50	41.5	28.0	110	91.2	61.5	170	140.9	95.1	230	190.7	128.6	290	240.4	162.2
51	42.3	28.5	111	92.0	62.1	171	141.8	95.6	231	191.5	129.2	291	241.2	162.7
52	43.1	29.1	112	92.8	62.6	172	142.6	96.2	232	192.3	129.7	292	242.1	163.3
53	43.9	29.6	113	93.7	63.2	173	143.4	96.7	233	193.2	130.3	293	242.9	163.8
54	44.8	30.2	114	94.5	63.7	174	144.2	97.3	234	194.0	130.9	294	243.7	164.4
55	45.6	30.8	115	95.3	64.3	175	145.1	97.9	235	194.8	131.4	295	244.6	165.0
56	46.4	31.3	116	96.2	64.9	176	145.9	98.4	236	195.6	132.0	296	245.4	165.6
57	47.3	31.9	117	97.0	65.4	177	146.7	99.0	237	196.5	132.5	297	246.2	166.1
58	48.1	32.4	118	97.8	66.0	178	147.6	99.5	238	197.3	133.1	298	247.0	166.6
59	48.9	33.0	119	98.7	66.5	179	148.4	100.1	239	198.1	133.6	299	247.9	167.2
60	49.7	33.6	120	99.5	67.1	180	149.2	100.7	240	199.0	134.2	300	248.7	167.8
Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.

for 56 Degrees.

Difference of Latitude and Departure for 35 Degrees.

Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.
1	00.8	00.6	61	50.0	35.0	121	99.1	69.4	181	148.2	103.8	241	197.4	138,2
2	01.6	01.1	62	50.8	35.6	122	99.9	70.0	182	149.1	104.4	242	198.2	138,8
3	02.5	01.7	63	51.6	36.1	123	100,7	70.5	183	149.9	105.0	243	199.0	139,4
4	03.3	02.3	64	52.4	36.7	124	101.6	71.1	184	150.7	105.5	244	199,8	139,9
5	04.1	02.9	65	53.2	37.3	125	102.4	71.7	185	151.5	106.1	245	200.6	140,5
6	04.9	03.4	66	54.1	37.9	126	103.2	72.3	186	152.3	106.7	246	201.5	141,1
7	05.7	04.0	67	54.9	38.4	127	104.0	72.8	187	153.1	107.2	247	202.3	141,7
8	06.6	04.6	68	55.7	39.0	128	104.8	73.4	188	154.0	107.8	248	203.1	142,2
9	07.4	05.2	69	56.5	39.6	129	105.6	74.0	189	154.8	108.4	249	203.9	142,8
10	08.2	05.7	70	57.3	40.1	130	106.5	74.6	190	155.6	109.0	250	204.7	143.4
11	09.0	06.3	71	58.1	40.7	131	107.3	75.1	191	156.4	109.5	251	205.6	143,9
12	09.8	06.9	72	59.0	41.3	132	108.1	75.7	192	157.2	110.1	252	206.4	144.5
13	10.6	07.5	73	59.8	41.9	133	108.9	76.3	193	158.1	110.7	253	207.2	145,1
14	11.5	08.0	74	60.6	42.4	134	109.7	76.8	194	158.9	111.3	254	208.0	145,7
15	12.3	08.6	75	61.4	43.0	135	110.6	77.4	195	159.7	111.8	255	208.8	146.2
16	12.1	09.2	76	62,2	43.6	136	111.4	78.0	196	160.5	112.4	256	209.6	146,8
17	13.9	09.7	77	63.1	44.2	137	112.2	78.6	197	161.3	113.0	257	210.5	147,4
18	14.7	10.3	78	63.9	44.7	138	113.0	79.1	198	162.2	113.6	258	211.3	148,0
19	15.6	10.9	79	64.7	45.3	139	113.8	79.7	199	163.0	114.1	259	212.1	148,5
20	16.4	11.5	80	65.5	45.6	140	114.6	80.1	200	163.8	114.7	260	212.9	149,1
21	17.2	12.0	81	66.3	46.5	141	115.5	80.9	201	164.6	115.3	261	213.8	149,7
22	18.0	12.6	82	67.2	47.0	142	116.3	81.4	202	165.4	115.8	262	214.6	150,3
23	18.8	13.2	83	68.0	47.6	143	117.1	82.0	203	166.3	116.4	263	215.4	150,8
24	19.6	13.8	84	68.8	48.2	144	117.9	82.6	204	167.1	117.0	264	216.2	151,4
25	20.5	14.3	85	69.6	48.7	145	118.8	83.2	205	167.9	117.6	265	217.0	152,0
26	21.3	14.9	86	70.4	49.3	146	119.6	83.7	206	168.7	118.1	266	217.8	152,6
27	22.1	15.5	87	71.3	49.9	147	120.4	84.3	207	169.5	118.7	267	218.7	153,1
28	22.9	16.1	88	72.1	50.5	148	121.2	84.9	208	170.3	119.3	268	219.5	153.7
29	23.8	16.6	89	72.9	51.0	149	122.0	85.5	209	171.2	119.9	269	220.3	154,2
30	24.6	17.2	90	73.7	51.6	150	122.8	86.0	210	172.0	120.4	270	221.1	154,8
31	25.4	17.8	91	74.5	52.2	151	123.7	86.6	211	172.8	121.0	271	221.9	155,4
32	26.2	18.9	92	75.3	52.8	152	124.5	87.2	212	173.6	121.6	272	222,8	156,0
33	27.0	18.4	93	76.2	53.3	153	125.3	87.7	213	174.4	122.2	273	223.6	156,6
34	27.8	19.5	94	77.0	53.9	154	126.1	88.3	214	175.3	122.7	274	224.4	157,2
35	28.7	20.1	95	77.8	54.5	155	126.9	88.9	215	176.1	123.3	275	225.2	157,7
36	29.5	20.6	96	78.6	55.1	156	127.8	89.5	216	176.9	123.9	276	226.0	158,3
37	30.3	21.2	97	79.4	55.6	157	128.6	90.0	217	177.7	124.4	277	226.9	158,9
38	31.1	21.8	98	80.3	56.2	158	129.4	90.6	218	178.5	125.0	278	227.7	159,4
39	31.9	22.4	99	80.1	56.8	159	130.2	91.2	219	179.4	125.6	279	228.5	160,0
40	32.8	22.9	100	81.9	57.4	160	131.0	91.8	220	180.2	126.2	280	229.3	160.6
41	33.6	23.5	101	82.7	57.9	161	131.9	92.3	221	181.0	126.7	281	230.1	161,2
42	34.4	24.1	102	83.5	58.5	162	132.7	92.9	222	181.8	127.3	282	231.0	161,7
43	35.2	24.7	103	84.4	59.1	163	133.5	93.5	223	182.6	127.9	283	231.8	162.3
44	36.0	25.2	104	85.2	59.6	164	134.3	94.1	224	183.5	128.5	284	232.6	162,9
45	36.9	25.8	105	86.0	60,2	165	135.1	94.6	225	184.3	129.0	285	233.4	163.4
46	37.7	26.4	106	86.8	60.8	166	136.0	95.2	226	185.1	129.6	286	234.2	164,0
47	38.5	27.0	107	87.6	61.4	167	136.8	95.8	227	185.9	130.2	287	235.0	164.6
48	39.3	27.5	108	88.5	61.9	168	137.6	96.3	228	186.7	130.8	288	235.9	165.2
49	40.1	28.1	109	89.3	62.5	169	138.4	96.9	229	187.5	131.3	289	236.7	165.7
50	41.0	28.7	110	90.1	63.1	170	139.2	97.5	230	188.4	131.9	290	237.5	166.3
51	41.8	29.2	111	90.9	63.7	171	140.0	98.1	231	189.2	132.5	291	238.3	166.9
52	42.6	29.8	112	91.7	64.2	172	140.9	98.6	232	190.0	133.1	292	239.1	167.5
53	43.4	30.4	113	92.5	64.8	173	141.7	99.2	233	190.8	133.6	293	240.0	168.0
54	44.2	31.0	114	93.4	65.4	174	142.5	99.8	234	191.6	134.2	294	240.8	168.6
95	45.0	31.5	115	94.2	66.0	175	143.3	100.4	235	192.5	134.8	295	241.6	169.2
56	45.9	32.1	116	95.0	66.5	176	144.1	100.9	236	193.3	135.3	296	242.4	169.8
57	46.7	32.7	117	95.8	67.1	177	145.0	101.5	237	194.1	135.9	297	243.2	170.3
58	47.5	33.3	118	96.6	67.7	178	145.8	102.1	238	194.9	136.5	298	244.1	170.9
59	48.3	33.8	119	97.5	68.2	179	146.6	102.7	239	195.7	137.1	299	244.9	171.5
60	49.1	34.4	120	98.3	68.8	180	147.4	103.2	240	196.6	137.6	300	245.7	172.1
Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.

for 55 Degrees.

Difference of Latitude and Departure for 36 Degrees.

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	00.8	00.6	61	49.3	35.9	121	97.9	71.1	181	146.4	106.4	241	295.0	141.7
2	01.6	01.2	62	50.2	36.4	122	98.7	71.7	182	147.2	107.0	242	295.8	142.2
3	02.4	01.8	63	51.0	37.0	123	99.5	72.3	183	148.0	107.6	243	296.6	142.8
4	03.2	02.4	64	51.8	37.6	124	100.3	72.9	184	148.9	108.2	244	297.4	143.4
5	04.0	02.9	65	52.6	38.2	125	101.1	73.5	185	149.7	108.7	245	298.2	144.0
6	04.9	03.5	66	53.4	38.8	122	101.9	74.1	186	150.5	109.3	246	299.0	144.6
7	05.7	04.1	67	54.2	39.4	127	102.7	74.7	187	151.3	109.9	247	299.8	145.2
8	06.5	04.7	68	55.0	40.0	128	103.6	75.2	188	152.1	110.5	248	200.6	145.8
9	07.3	05.3	69	55.8	40.6	129	104.4	75.8	189	152.9	111.1	249	201.4	146.2
10	08.1	05.9	70	56.6	41.1	130	105.2	76.4	190	153.7	111.7	250	202.2	146.8
11	08.9	06.5	71	57.4	41.7	131	106.0	77.0	191	154.5	112.3	251	203.1	147.5
12	09.7	07.1	72	58.2	42.3	132	106.8	77.6	192	155.3	112.9	252	203.9	148.1
13	10.5	07.6	73	59.1	42.9	133	107.6	78.2	193	156.1	113.4	253	204.7	148.7
14	11.3	08.2	74	59.9	43.5	134	108.4	78.8	194	156.9	114.0	254	205.5	149.3
15	12.1	08.8	75	60.7	44.1	135	109.2	79.4	195	157.8	114.6	255	206.3	149.9
16	12.9	09.4	76	61.5	44.7	136	110.0	79.9	196	158.6	115.2	256	207.1	150.5
17	13.8	10.0	77	62.3	45.3	137	110.8	80.5	197	159.4	115.8	257	207.9	151.1
18	14.6	10.6	78	63.1	45.8	138	111.6	81.1	198	160.2	116.4	258	208.7	151.7
19	15.4	11.2	79	63.9	46.4	139	112.5	81.7	199	161.0	117.0	259	209.5	152.2
20	16.2	11.8	80	64.7	47.0	140	113.3	82.3	100	161.8	117.6	260	210.3	152.8
21	17.0	12.3	81	65.5	47.6	141	114.1	82.9	101	162.6	118.1	261	211.1	153.4
22	17.8	12.9	82	66.3	48.2	142	114.9	83.5	102	163.4	118.7	262	212.0	154.0
23	18.6	13.5	83	67.1	48.8	143	115.7	84.1	103	164.2	119.3	263	212.8	154.6
24	19.4	14.1	84	68.0	49.4	144	116.5	84.6	104	165.0	119.9	264	213.6	155.2
25	20.2	14.7	85	68.8	50.0	145	117.3	85.2	105	165.8	120.5	265	214.4	155.8
26	21.0	15.3	86	69.6	50.6	146	118.1	85.8	106	166.7	121.1	266	215.2	156.4
27	21.8	15.9	87	70.4	51.1	147	118.9	86.4	107	167.5	121.7	267	216.0	156.9
28	22.7	16.5	88	71.2	51.7	148	119.7	87.0	108	168.3	122.3	268	216.8	157.5
29	23.5	17.0	89	72.0	52.3	149	120.5	87.6	109	169.1	122.8	269	217.6	158.1
30	24.3	17.6	90	72.8	52.9	150	121.3	88.2	110	169.9	123.4	270	218.4	158.7
31	25.1	18.2	91	73.6	53.5	151	122.2	88.8	211	170.7	124.0	271	219.2	159.3
32	25.9	18.8	92	74.4	54.1	152	123.0	89.3	212	171.5	124.6	272	220.0	159.9
33	26.7	19.4	93	75.2	54.7	153	123.8	89.9	213	172.3	125.2	273	220.9	160.5
34	27.5	20.0	94	76.0	55.3	154	124.6	90.5	214	173.1	125.8	274	221.7	161.1
35	28.3	20.6	95	76.9	55.8	155	125.4	91.1	215	173.9	126.4	275	222.5	161.6
36	29.1	21.2	96	77.7	56.4	156	126.2	91.7	216	174.7	123.0	276	223.3	162.2
37	29.9	21.7	97	78.5	57.0	157	127.0	92.3	217	175.6	127.6	277	224.1	162.8
38	30.7	22.3	98	79.3	57.6	158	127.8	92.9	218	176.4	128.1	278	224.9	163.4
39	31.6	22.9	99	80.1	58.2	159	128.6	93.5	219	177.2	128.7	279	225.7	164.0
40	32.4	23.5	100	80.9	58.8	160	129.4	94.0	220	178.0	129.3	280	226.5	164.6
41	33.2	24.1	101	81.7	59.4	161	130.2	94.6	221	178.8	129.9	281	227.3	165.2
42	34.0	24.7	102	82.5	60.0	162	131.1	95.2	222	179.6	130.5	282	228.1	165.8
43	34.8	25.3	103	83.3	60.5	163	131.9	95.8	223	180.4	131.1	283	228.9	166.3
44	35.6	25.9	104	84.1	61.1	164	132.7	96.4	224	181.2	131.7	284	229.8	166.9
45	36.4	26.5	105	84.9	61.7	165	133.5	97.0	225	182.0	132.3	285	230.6	167.5
46	37.2	27.1	106	85.8	62.3	166	134.3	97.6	226	182.8	132.8	286	231.4	168.1
47	38.0	27.6	107	86.6	62.9	167	135.1	98.2	227	183.6	133.4	287	232.2	168.7
48	38.8	28.2	108	87.4	63.5	168	135.9	98.7	228	184.5	134.0	288	233.0	169.3
49	39.6	28.8	109	88.2	64.1	169	136.7	99.3	229	185.3	134.6	289	233.8	169.9
50	40.5	29.4	110	89.0	64.7	170	137.5	99.9	230	186.1	135.2	290	234.6	170.5
51	41.3	30.0	111	89.8	65.2	171	138.3	100.5	231	186.9	135.8	291	235.4	171.0
52	42.1	30.6	112	90.6	65.8	172	139.1	101.1	232	187.7	136.4	292	236.2	171.6
53	42.9	31.2	113	91.4	66.4	173	140.0	101.7	233	188.5	137.0	293	237.0	172.2
54	43.7	31.7	114	92.2	67.0	174	140.8	102.3	234	189.3	137.5	294	237.8	172.8
55	44.5	32.3	115	93.0	67.6	175	141.6	102.9	235	190.1	138.1	295	238.7	173.4
56	45.3	32.9	116	93.8	68.2	176	142.4	103.5	236	190.9	138.7	296	239.5	174.0
57	46.1	33.5	117	94.7	68.8	177	143.2	104.0	237	191.7	139.3	297	240.3	174.6
58	46.9	34.1	118	95.5	69.4	178	144.0	104.6	238	192.5	139.9	298	241.1	175.2
59	47.7	34.7	119	96.3	69.9	179	144.8	105.2	239	193.3	140.5	299	241.9	175.7
60	48.5	35.3	120	97.1	70.5	180	145.6	105.8	240	194.2	141.1	300	242.7	176.3
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

for 54 Degrees.

Difference of Latitude and Departure for 37 Degrees.

Diſt.	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.
1	00.8	00.6	61	48.7	36.7	121	96.6	72.8	181	144.5	108.9	181	192.5	145.0
2	01.6	01.2	62	49.5	37.3	122	97.4	73.4	182	145.3	109.5	182	193.3	145.6
3	02.4	01.8	63	50.3	37.9	123	98.2	74.0	183	146.1	110.1	183	194.1	146.2
4	03.2	02.4	64	51.1	38.5	124	99.0	74.6	184	146.9	110.7	184	194.9	146.8
5	04.0	03.0	65	51.9	39.1	125	99.8	75.2	185	147.7	111.3	185	195.7	147.4
6	04.8	03.6	66	52.7	39.7	126	100.6	75.8	186	148.5	111.9	186	196.5	148.0
7	05.6	04.3	67	53.5	40.3	127	101.4	76.4	187	149.3	112.5	187	197.3	148.6
8	06.4	04.8	68	54.3	40.9	128	102.2	77.0	188	150.1	113.1	188	198.1	149.2
9	07.2	05.4	69	55.1	41.5	129	103.0	77.6	189	150.9	113.7	189	198.9	149.8
10	08.0	06.0	70	55.9	42.1	130	103.8	78.2	190	151.7	114.3	190	199.7	150.4
11	08.8	06.6	71	56.7	42.7	131	104.6	78.8	191	152.5	114.9	191	200.4	151.0
12	09.6	07.2	72	57.5	43.3	132	105.4	79.4	192	153.3	115.5	192	201.2	151.6
13	10.4	07.8	73	58.3	43.9	133	106.2	80.0	193	154.1	116.1	193	202.0	152.2
14	11.2	08.4	74	59.1	44.5	134	107.0	80.6	194	154.9	116.7	194	202.8	152.9
15	12.0	09.0	75	59.9	45.1	135	107.8	81.2	195	155.7	117.3	195	203.6	153.5
16	12.8	09.6	76	60.7	45.7	136	108.6	81.8	196	156.5	117.9	196	204.4	154.1
17	13.6	10.2	77	61.5	46.3	137	109.4	82.4	197	157.3	118.6	197	205.2	154.7
18	14.4	10.8	78	62.3	46.3	138	110.2	83.0	198	158.1	119.2	198	206.0	155.3
19	15.2	11.4	79	63.1	47.5	139	111.0	83.6	199	158.9	119.8	199	206.8	155.9
20	16.0	12.0	80	63.9	48.1	140	111.8	84.2	200	159.7	120.4	200	207.6	156.5
21	16.8	12.6	81	64.7	48.7	141	112.6	84.9	201	160.5	121.0	201	208.4	157.1
22	17.6	13.2	82	65.5	49.3	142	113.4	85.5	202	161.3	121.6	202	209.2	157.7
23	18.4	13.8	83	66.3	49.9	143	114.2	85.1	203	162.1	122.2	203	210.0	158.3
24	19.2	14.4	84	67.1	60.6	144	115.0	86.7	204	162.9	122.8	204	210.8	158.9
25	20.0	15.0	85	67.9	51.2	145	115.8	87.3	205	163.7	123.4	205	211.6	159.5
26	20.8	15.6	86	68.7	51.8	146	116.6	87.9	206	164.5	124.0	206	212.4	160.1
27	21.6	16.2	87	69.5	52.4	147	117.4	88.5	207	165.3	124.6	207	213.2	160.7
28	22.4	16.9	88	70.3	53.0	148	118.2	89.1	208	166.1	125.2	208	214.0	161.3
29	23.2	17.5	89	71.1	53.6	149	119.0	89.7	209	166.9	125.8	209	214.8	161.9
30	24.0	18.1	90	71.9	54.2	150	119.8	90.3	210	167.7	126.4	210	215.6	162.5
31	24.8	18.7	91	72.7	54.8	151	120.6	90.9	211	168.5	127.0	211	216.4	163.1
32	25.6	19.3	92	73.5	55.4	152	121.4	91.5	212	169.3	127.6	212	217.2	163.7
33	26.4	19.9	93	74.3	56.0	153	122.2	92.1	213	170.1	128.2	213	218.0	164.3
34	27.2	20.5	94	75.1	56.6	154	123.0	92.7	214	170.9	128.8	214	218.8	164.9
35	28.0	21.1	95	75.9	57.2	155	123.8	93.3	215	171.7	129.8	215	219.6	165.5
36	28.7	21.7	96	76.7	57.8	156	124.6	93.9	216	172.5	130.0	216	220.4	166.1
37	29.5	22.3	97	77.5	58.4	157	125.4	94.5	217	173.3	130.6	217	221.2	166.7
38	30.3	22.9	98	78.3	59.0	158	126.2	95.1	218	174.1	131.2	218	221.0	167.3
39	31.1	23.5	99	79.1	59.6	159	127.0	95.7	219	174.9	131.8	219	222.8	167.9
40	31.9	24.1	100	79.9	60.2	160	127.8	96.3	220	175.7	132.4	220	223.6	168.5
41	32.7	24.7	101	80.7	60.8	161	128.6	96.9	221	176.5	133.0	221	224.4	169.1
42	33.5	25.3	102	81.5	61.4	162	129.4	97.5	222	177.3	133.6	222	225.2	169.7
43	34.3	25.9	103	82.3	62.0	163	130.2	98.1	223	178.1	134.2	223	226.0	170.3
44	35.1	26.5	104	83.1	62.6	164	131.0	98.7	224	178.9	134.8	224	226.8	170.9
45	35.9	27.1	105	83.9	63.2	165	131.8	99.3	225	179.7	135.4	225	227.6	171.5
46	36.7	27.7	106	84.7	63.8	166	132.6	99.9	226	180.5	136.0	226	228.4	172.1
47	37.5	28.3	107	85.5	64.4	167	133.4	100.5	227	181.3	136.6	227	229.2	172.7
48	38.3	28.9	108	86.2	65.0	168	134.2	101.1	228	182.1	137.2	228	230.0	173.3
49	39.1	29.5	109	87.0	65.6	169	135.0	101.7	229	182.9	137.8	229	230.8	173.9
50	39.9	30.1	110	87.8	66.2	170	135.8	102.3	230	183.7	138.4	230	231.6	174.5
51	40.7	30.7	111	88.6	66.8	171	136.6	102.9	231	184.5	139.0	231	232.4	175.1
52	41.5	31.3	112	89.4	67.4	172	137.4	103.5	232	185.3	139.6	232	233.2	175.7
53	42.3	31.9	113	90.2	68.0	173	138.2	104.1	233	186.1	140.2	233	234.0	176.3
54	42.1	32.5	114	91.0	68.6	174	139.0	104.7	234	186.9	140.8	234	234.8	176.9
55	43.9	33.1	115	91.8	69.2	175	139.8	105.3	235	187.7	141.4	235	235.6	177.5
56	44.7	33.7	116	92.6	69.8	176	140.6	105.9	236	188.5	142.0	236	236.4	178.1
57	45.5	34.3	117	93.4	70.4	177	141.4	106.5	237	189.3	142.6	237	237.2	178.7
58	46.3	34.9	118	94.2	71.0	178	142.2	107.1	238	190.1	143.2	238	238.0	179.3
59	47.1	35.5	119	95.0	71.6	179	142.9	107.7	239	190.9	143.8	239	238.8	179.9
60	47.9	36.1	120	95.9	72.2	180	143.7	108.3	240	191.7	144.4	240	239.6	180.5
Diſt.	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.

for 53 Degrees.

Difference of Latitude and Departure for 34 Degrees.

Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.
1	00.8	00.6	61	50.6	34.1	121	100.3	67.7	181	150.0	101.2	241	199.8	134.8
2	01.7	01.1	62	51.4	34.7	122	101.1	68.2	182	150.9	101.8	242	200.6	135.3
3	02.5	01.7	63	52.2	35.2	123	102.0	68.8	183	151.7	102.3	243	201.4	135.9
4	03.3	02.2	64	53.1	35.8	124	102.8	69.3	184	152.5	102.9	244	202.3	136.4
5	04.1	02.8	65	53.9	36.3	125	103.6	69.9	185	153.4	103.5	245	203.1	137.0
6	05.0	03.4	66	54.7	36.9	126	104.5	70.5	186	154.2	104.0	246	203.9	137.6
7	05.8	03.9	67	55.5	37.5	127	105.3	71.0	187	155.0	104.6	247	204.8	138.1
8	06.6	04.5	68	56.4	38.0	128	106.1	71.6	188	155.9	105.1	248	205.6	138.7
9	07.5	05.0	69	57.2	38.6	129	106.9	72.1	189	156.7	105.7	249	206.4	139.2
10	08.3	05.6	70	58.0	39.1	130	107.8	72.7	190	157.5	106.2	250	207.3	139.8
11	09.1	06.2	71	58.9	39.7	131	108.6	73.3	191	158.3	106.8	251	208.1	140.4
12	09.9	06.7	72	59.7	40.3	132	109.4	73.8	192	159.2	107.4	252	208.9	140.9
13	10.8	07.3	73	60.5	40.8	133	110.3	74.4	193	160.0	107.9	253	209.7	141.5
14	11.6	07.8	74	61.3	41.4	134	111.1	74.9	194	160.8	108.5	254	210.6	142.0
15	12.4	08.4	75	62.2	41.9	135	111.9	75.5	195	161.7	109.0	255	211.4	142.6
16	13.3	08.9	76	63.0	42.5	136	112.7	76.1	196	162.5	109.6	256	212.2	143.2
17	14.1	09.5	77	63.8	43.1	137	113.6	76.6	197	163.3	110.2	257	213.1	143.7
18	14.9	10.1	78	64.7	43.6	138	114.4	77.2	198	164.1	110.7	258	213.9	144.3
19	15.8	10.6	79	65.5	44.2	139	115.2	77.7	199	165.0	111.3	259	214.7	144.8
20	16.6	11.2	80	66.3	44.7	140	116.1	78.3	200	165.8	111.8	260	215.5	145.4
21	17.4	11.7	81	67.1	45.3	141	116.9	78.8	201	166.6	112.4	261	216.4	146.0
22	18.2	12.3	82	68.0	45.9	142	117.7	79.4	202	167.5	113.0	262	217.2	146.5
23	19.1	12.9	83	68.8	46.4	143	118.5	80.0	203	168.3	113.5	263	218.0	147.1
24	19.9	13.4	84	69.6	47.0	144	119.4	80.5	204	169.1	114.1	264	218.9	147.6
25	20.7	14.0	85	70.5	47.5	145	120.2	81.1	205	169.9	114.6	265	219.7	148.2
26	21.6	14.5	86	71.3	48.1	146	121.0	81.6	206	170.8	115.2	266	220.5	148.7
27	22.4	15.1	87	72.1	48.7	147	121.9	82.2	207	171.6	115.8	267	221.3	149.3
28	23.2	15.7	88	73.0	49.2	148	122.7	82.8	208	172.4	116.3	268	222.2	149.9
29	24.0	16.2	89	73.8	49.8	149	123.5	83.3	209	173.3	116.9	269	223.0	150.4
30	24.9	16.8	90	74.6	50.3	150	124.4	83.9	210	174.1	117.4	270	223.8	151.0
31	25.7	17.3	91	75.4	50.9	151	125.2	84.4	211	174.9	118.0	271	224.7	151.5
32	26.5	17.9	92	76.3	51.4	152	126.0	85.0	212	175.7	118.6	272	225.5	152.1
33	27.4	18.5	93	77.1	52.0	153	126.8	85.6	213	176.6	119.1	273	226.3	152.7
34	28.2	19.0	94	77.9	52.6	154	127.7	86.1	214	177.4	119.7	274	227.1	153.2
35	29.0	19.6	95	78.8	53.1	155	128.5	86.7	215	178.2	120.2	275	228.0	153.8
36	29.8	20.1	96	79.6	53.7	156	129.3	87.2	216	179.1	120.8	276	228.8	154.3
37	30.7	20.7	97	80.4	54.2	157	130.2	87.8	217	179.9	121.3	277	229.6	154.9
38	31.5	21.2	98	81.2	54.8	158	131.0	88.4	218	180.7	121.9	278	230.5	155.5
39	32.3	21.8	99	82.1	55.4	159	131.8	88.9	219	181.6	122.5	279	231.3	156.0
40	33.2	22.4	100	82.9	55.9	160	132.6	89.5	220	182.4	123.0	280	232.1	156.6
41	34.0	22.9	101	83.7	56.5	161	133.5	90.0	221	183.2	123.6	281	232.9	157.1
42	34.8	23.5	102	84.6	57.0	162	134.3	90.6	222	184.0	124.1	282	233.8	157.7
43	35.6	24.0	103	85.4	57.6	163	135.1	91.1	223	184.9	124.7	283	234.6	158.3
44	36.5	24.6	104	86.2	58.2	164	136.0	91.7	224	185.7	125.3	284	235.4	158.8
45	37.3	25.2	105	87.0	58.7	165	136.8	92.3	225	186.5	125.8	285	236.3	159.4
46	38.1	25.7	106	87.9	59.3	166	137.6	92.8	226	187.4	126.4	186	237.1	159.9
47	39.0	26.3	107	88.7	59.8	167	138.4	93.4	127	188.2	126.9	287	237.9	160.5
48	39.8	26.8	108	89.5	60.4	168	139.3	93.9	228	189.0	127.5	288	238.8	161.0
49	40.6	27.4	109	90.4	61.0	169	140.1	94.5	229	189.8	128.1	289	239.6	161.6
50	41.5	28.0	110	91.2	61.5	170	140.9	95.1	230	190.7	128.6	290	240.4	162.2
51	42.3	28.5	111	92.0	62.1	171	141.8	95.6	231	191.5	129.2	291	241.2	162.7
52	43.1	29.1	112	92.8	62.6	172	142.6	96.2	232	192.3	129.7	292	242.1	163.3
53	43.9	29.6	113	93.7	63.2	173	143.4	96.7	233	193.2	130.3	293	242.9	163.8
54	44.8	30.2	114	94.5	63.7	174	144.2	97.3	234	194.0	130.9	294	243.7	164.4
55	45.6	30.8	115	95.3	64.3	175	145.1	97.9	235	194.8	131.4	295	244.6	165.0
56	46.4	31.3	116	96.2	64.9	176	145.9	98.4	236	195.6	132.0	296	245.4	165.6
57	47.3	31.9	117	97.0	65.4	177	146.7	99.0	237	196.5	132.5	297	246.2	166.1
58	48.1	32.4	118	97.8	66.0	178	147.6	99.5	238	197.3	133.1	298	247.0	166.6
59	48.9	33.0	119	98.7	66.5	179	148.4	100.1	239	198.1	133.6	299	247.9	167.2
60	49.7	33.6	120	99.5	67.1	180	149.2	100.7	240	199.0	134.2	300	248.7	167.8
Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.

for 56 Degrees.

Difference of Latitude and Departure for 39 Degrees.

Diſt.	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.
1	00.8	00.6	61	47.4	38.4	121	94.0	76.1	241	140.7	113.9	241	187.3	151.7
2	01.6	01.3	62	48.2	39.0	122	94.8	76.8	242	141.4	114.5	242	188.1	152.3
3	02.3	01.9	63	49.0	39.6	123	95.6	77.4	243	142.2	115.2	243	188.8	152.9
4	03.1	02.5	64	49.7	40.3	124	96.4	78.0	244	143.0	115.8	244	189.6	153.6
5	03.9	03.1	65	50.5	40.9	125	97.1	78.7	245	143.8	116.4	245	190.4	154.2
6	04.7	03.8	66	51.3	41.5	126	97.9	79.3	246	144.5	117.1	246	191.2	154.8
7	05.4	04.4	67	52.1	42.2	127	98.7	79.9	247	145.3	117.7	247	191.9	155.4
8	06.2	05.0	68	52.8	42.8	128	99.5	80.6	248	146.1	118.3	248	192.7	156.1
9	07.0	05.7	69	53.6	43.4	129	00.2	81.2	249	146.9	118.9	249	193.5	156.7
10	07.8	06.3	70	54.4	44.1	130	101.0	81.8	250	147.6	119.6	250	194.3	157.3
11	08.5	06.9	71	55.2	44.7	131	101.8	82.4	251	148.4	120.2	251	195.1	158.0
12	09.3	07.6	72	56.0	45.3	132	102.6	83.1	252	149.2	120.8	252	195.8	158.6
13	10.1	08.2	73	56.7	45.9	133	103.4	83.7	253	150.0	121.5	253	196.6	159.2
14	10.9	08.8	74	57.5	46.6	134	104.1	84.3	254	150.8	122.1	254	197.4	159.8
15	11.7	09.4	75	58.3	47.2	135	104.9	85.0	255	151.5	122.7	255	198.2	160.5
16	12.4	10.1	76	59.1	47.8	136	105.7	85.6	256	152.3	123.3	256	198.9	161.1
17	13.2	10.7	77	59.8	48.5	137	106.5	86.2	257	153.1	124.0	257	199.7	161.7
18	14.0	11.3	78	60.6	49.1	138	107.2	86.8	258	153.9	124.6	258	200.5	162.4
19	14.8	12.0	79	61.4	49.7	139	108.0	87.5	259	154.6	125.2	259	201.3	163.8
20	15.5	12.6	80	62.2	50.3	140	108.8	88.1	260	155.4	125.9	260	202.0	163.6
21	16.3	13.2	81	62.9	51.0	141	109.6	88.7	261	156.2	126.5	261	202.8	164.2
22	17.1	13.8	82	63.7	51.6	142	110.3	89.4	262	157.0	127.1	262	203.6	164.9
23	17.9	14.5	83	64.5	52.2	143	111.1	90.0	263	157.8	127.7	263	204.4	165.5
24	18.7	15.1	84	65.3	52.9	144	111.9	90.6	264	158.5	128.4	264	205.2	166.1
25	19.4	15.7	85	66.1	53.5	145	112.7	91.2	265	159.3	129.0	265	205.9	166.8
26	20.2	16.4	86	66.8	54.1	146	113.5	91.9	266	160.1	129.6	266	206.7	167.4
27	21.0	17.0	87	67.6	54.7	147	114.2	92.5	267	160.9	130.3	267	207.5	168.0
28	21.8	17.6	88	68.4	55.4	148	115.0	93.1	268	161.6	130.9	268	208.3	168.7
29	22.5	18.2	89	69.2	56.0	149	115.8	93.8	269	162.4	131.5	269	209.0	169.3
30	23.3	18.9	90	69.9	56.6	150	116.6	94.4	270	163.2	132.2	270	209.8	169.6
31	24.1	19.5	91	70.7	57.3	151	117.3	95.0	271	163.9	132.8	271	210.6	170.5
32	24.9	20.1	92	71.5	57.9	152	118.1	95.7	272	164.7	133.4	272	211.4	171.2
33	25.6	20.8	93	72.5	58.5	153	118.9	96.3	273	16 .6	134.0	273	212.1	171.8
34	26.4	21.4	94	73.0	59.2	154	119.7	96.9	274	166.3	134.7	274	212.9	172.4
35	27.2	22.0	95	73.8	59.8	155	120.5	97.5	275	167.1	135.3	275	213.7	173.1
36	28.0	22.7	96	74.6	60.4	156	121.2	98.2	276	167.9	135.9	276	214.5	173.7
37	28.8	23.3	97	75.4	60.9	157	122.0	98.8	277	168.	136.6	277	215.3	174.5
38	29.5	23.9	98	76.2	61.7	158	122.8	99.4	278	169.4	137.2	278	216.0	174.9
39	30.3	24.5	99	76.9	62.3	159	123.6	100.1	279	170.2	137.8	279	216.8	175.6
40	31.1	25.2	100	77.7	62.9	160	124.3	100.7	280	171.0	138.4	280	217.6	176.2
41	31.9	25.8	101	78.5	63.6	161	125.1	101.3	281	171.7	139.1	281	218.4	176.8
42	32.6	26.4	102	79.3	64.2	162	125.9	101.9	282	172.5	139.7	282	219.1	177.5
43	33.4	27.1	103	80.0	64.8	163	126.7	102.6	283	173.3	140.3	283	219.9	178.1
44	34.2	27.7	104	80.8	65.4	164	127.4	103.2	284	174.1	141.0	284	220.7	178.7
45	35.0	28.3	105	81.6	66.1	165	128.2	103.8	285	174.8	141.6	285	221.5	179.4
46	35.7	28.9	106	82.4	66.7	166	129.0	104.5	286	175.6	142.2	285	222.3	180.0
47	36.5	29.6	107	83.1	67.3	167	129.8	105.1	287	176.4	142.9	287	223.0	180.6
48	37.3	30.2	108	83.9	68.0	168	130.6	105.7	288	177.2	143.5	288	223.8	181.2
49	38.1	30.8	109	84.7	68.6	169	131.3	106.4	289	178.0	144.1	289	224.6	181.9
50	38.9	31.5	110	85.5	69.2	170	132.1	107.0	290	178.7	144.7	290	225.4	182.5
51	39.6	32.1	111	86.3	69.9	171	132.9	107.6	291	179.5	145.4	291	226.1	183.1
52	40.4	32.7	112	87.0	70.5	172	133.7	108.2	292	180.3	146.0	292	226.0	183.8
53	41.2	33.4	113	87.8	71.1	173	134.4	108.9	293	181.1	146.6	293	227.7	184.4
54	42.0	34.0	114	88.6	71.7	174	135.2	109.5	294	181.8	147.3	294	228.5	185.0
55	42.7	34.6	115	89.4	72.4	175	136.0	110.1	295	182.6	147.9	295	229.2	185.6
56	43.5	35.2	116	90.1	73.0	176	136.8	110.8	296	183.4	148.5	296	230.0	186.3
57	44.3	35.9	117	90.9	73.6	177	137.5	111.4	297	184.2	149.1	297	230.8	186.9
58	45.1	36.5	118	91.7	74.3	178	138.3	112.0	298	185.0	149.8	298	231.6	187.5
59	45.8	37.1	119	92.5	74.9	179	139.1	112.6	299	185.7	150.4	299	232.4	188.2
60	46.6	37.8	120	93.3	75.5	180	139.9	113.3	300	186.5	151.0	300	233.1	188.8
Diſt.	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.

for 51 Degrees.

Difference of Latitude and Departure for 40 Degrees.

Dist.	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.
1	00.8	00.6	61	46.7	39.2	121	92.7	77.8	181	138.6	116.4	241	184.6	154.9
2	01.5	01.3	62	47.5	39.9	122	93.4	78.4	182	139.4	117.0	242	185.4	155.6
3	02.3	01.9	63	48.3	40.5	123	64.2	79.1	183	140.2	117.7	243	186.1	156.2
4	03.1	02.6	64	49.0	41.1	124	95.0	79.7	184	140.9	118.3	244	186.9	156.9
5	03.8	03.2	65	49.8	41.8	125	95.7	80.4	185	141.7	118.9	245	187.7	157.5
6	04.6	03.9	66	50.6	42.4	126	96.5	81.0	186	142.5	119.6	246	188.4	158.1
7	05.4	04.5	67	51.3	43.1	127	97.3	81.6	187	143.2	120.2	247	189.2	158.8
8	06.1	05.1	68	52.1	43.7	128	98.0	82.3	188	144.0	120.9	248	190.0	159.4
9	06.9	05.8	69	52.9	44.4	129	98.8	82.9	189	144.8	121.5	249	190.7	160.1
10	07.7	06.4	70	53.6	45.0	130	99.6	83.6	190	145.5	122.1	250	191.5	160.7
11	08.4	07.1	71	54.4	45.6	131	100.3	84.2	191	146.3	122.8	251	192.3	161.4
12	09.2	07.7	72	55.2	46.3	132	101.1	84.9	192	147.1	123.4	252	193.0	162.0
13	10.0	08.4	73	55.9	46.9	133	101.9	85.5	193	147.8	124.1	253	193.8	162.6
14	10.7	09.0	74	56.7	47.6	134	102.6	86.1	194	148.6	124.7	254	194.6	163.3
15	11.5	09.6	75	57.4	48.2	135	103.4	86.8	195	149.4	125.4	255	195.3	163.9
16	12.3	10.3	76	58.2	48.9	136	104.2	87.4	196	150.1	126.0	256	196.1	164.6
17	13.0	10.9	77	59.0	49.5	137	104.9	88.1	197	150.9	126.6	257	196.9	165.2
18	13.8	11.6	78	59.7	50.1	138	105.7	88.7	198	151.7	127.3	258	197.6	165.9
19	14.6	12.2	79	60.5	50.8	139	106.5	89.4	199	152.4	127.9	259	198.4	166.5
20	15.3	12.9	80	61.3	51.4	140	107.2	90.0	200	153.2	128.6	260	199.2	167.1
21	16.1	13.5	81	62.0	52.1	141	108.0	90.6	201	154.0	129.2	261	199.9	167.8
22	16.9	14.1	82	62.8	52.7	142	108.8	91.3	202	154.7	129.9	262	200.7	168.4
23	17.6	14.8	83	63.6	3.4	143	109.5	91.9	203	155.5	130.5	263	201.4	169.1
24	18.4	15.4	84	64.3	54.0	144	110.3	92.6	204	156.3	131.1	264	202.2	169.7
25	19.2	16.1	85	65.1	54.6	145	111.1	93.2	205	157.0	131.8	265	203.0	170.4
26	19.9	16.7	86	65.9	55.3	146	111.8	93.9	206	157.8	132.4	266	203.7	171.0
27	20.7	17.4	87	66.6	55.9	147	112.6	94.5	207	158.6	133.1	267	204.5	171.6
28	21.4	18.0	88	67.4	56.6	148	113.4	95.1	208	159.3	133.7	268	205.3	172.3
29	22.2	18.6	89	68.2	57.2	149	114.6	95.8	209	160.1	134.4	269	206.0	172.9
30	23.0	19.3	90	68.9	57.9	150	114.9	96.4	210	160.9	135.0	270	206.8	173.6
31	23.7	19.9	91	69.7	58.5	151	115.7	97.1	211	161.6	135.6	271	207.6	174.2
32	24.5	20.6	92	70.5	59.1	152	116.4	97.7	212	162.4	136.3	272	208.3	174.8
33	25.3	21.2	93	71.2	59.8	153	117.2	98.4	213	163.2	136.9	273	209.1	175.5
34	26.0	21.9	94	72.0	60.4	154	118.0	99.0	214	163.9	137.6	274	209.9	176.1
35	26.8	22.5	95	72.8	61.1	155	118.7	99.6	215	164.7	138.2	275	210.6	176.8
36	27.6	23.1	96	73.5	61.7	156	119.5	100.3	216	65.4	138.8	276	211.4	177.4
37	28.3	23.8	97	74.3	62.4	157	120.3	100.9	217	166.2	139.5	277	212.2	178.1
38	29.1	24.4	98	75.1	63.0	158	121.0	101.6	218	167.0	140.1	278	212.9	178.7
39	29.9	25.1	99	75.8	63.6	159	121.8	102.2	219	167.7	140.8	279	213.7	179.3
40	30.6	25.7	100	76.6	64.3	160	122.6	102.8	220	168.5	141.4	280	214.5	180.0
41	31.4	26.4	101	77.4	64.9	161	123.3	103.5	221	169.3	142.1	281	215.2	180.6
42	32.2	27.0	102	78.1	65.6	162	124.1	104.1	222	170.0	142.7	282	216.0	181.3
43	32.9	27.6	103	78.9	66.2	163	124.9	104.8	223	170.8	143.3	283	216.8	181.9
44	33.7	28.3	104	79.7	66.8	164	125.6	105.4	224	171.6	144.0	284	217.5	182.6
45	34.5	28.9	105	80.4	67.5	165	126.4	106.1	225	172.3	144.6	285	218.3	183.2
46	35.2	29.6	106	81.2	68.1	166	127.2	106.7	226	173.1	145.3	286	219.1	183.9
47	36.0	30.2	107	82.0	68.8	167	127.9	107.3	227	173.9	145.9	287	219.8	184.5
48	36.8	30.8	108	82.7	69.4	168	128.7	108.0	228	174.6	146.6	288	220.6	185.1
49	37.5	31.5	109	83.5	70.1	169	129.4	108.6	229	175.4	147.2	289	221.4	185.8
50	38.3	32.1	110	84.3	70.7	170	130.2	109.3	230	176.2	147.9	290	222.1	186.4
51	39.1	32.8	111	85.0	71.3	171	131.0	109.9	231	176.9	148.5	291	222.9	187.1
52	39.8	33.4	112	85.8	72.0	172	131.7	110.6	232	177.7	149.1	292	223.7	187.7
53	40.6	34.1	113	86.6	72.6	173	132.5	111.2	233	178.5	149.8	293	224.4	188.4
54	41.4	34.7	114	87.3	73.3	174	133.3	111.9	234	179.2	150.4	294	225.2	189.0
55	42.1	35.3	115	88.1	73.9	175	134.0	112.5	235	180.0	151.1	295	226.0	189.6
56	42.9	36.0	116	88.9	74.6	176	134.8	113.1	236	180.8	151.7	296	226.7	190.3
57	43.7	36.6	117	89.6	75.2	177	135.6	113.8	237	181.5	152.4	297	227.5	190.9
58	44.4	37.3	118	90.4	75.9	178	136.3	114.4	238	182.3	153.0	298	228.3	191.6
59	45.2	37.6	119	91.2	76.5	179	137.1	115.1	239	183.1	153.6	299	229.0	192.2
60	46.0	38.6	120	91.9	77.1	180	137.9	115.7	240	183.8	154.3	300	229.8	192.9
Dist.	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

For 50 Degrees.

Difference of Latitude and Departure for 39 Degrees.

Diſt.	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.
1	00.8	00.6	61	47.4	38.4	121	94.0	76.1	241	140.7	113.9	241	187.3	151.7
2	01.6	01.3	62	48.2	39.0	122	94.8	76.8	242	141.4	114.5	242	188.1	152.3
3	02.3	01.9	63	49.0	39.6	123	95.6	77.4	243	142.2	115.2	243	188.8	152.9
4	03.1	02.5	64	49.7	40.3	124	96.4	78.0	244	143.0	115.8	244	189.6	153.6
5	03.9	03.1	65	50.5	40.9	125	97.1	78.7	245	143.8	116.4	245	190.4	154.2
6	04.7	03.8	66	51.3	41.5	126	97.9	79.3	246	144.5	117.1	246	191.2	154.8
7	05.4	04.4	67	52.1	42.2	127	98.7	79.9	247	145.3	117.7	247	191.9	155.4
8	06.2	05.0	68	52.8	42.8	128	99.5	80.6	248	146.1	118.3	248	192.7	156.1
9	07.0	05.7	69	53.6	43.4	129	00.2	81.2	249	146.9	118.9	249	193.5	156.7
10	07.8	06.3	70	54.4	44.1	130	101.0	81.8	250	147.6	119.6	250	194.3	157.3
11	08.5	06.9	71	55.2	44.7	131	101.8	87.4	251	148.4	120.2	251	195.1	158.0
12	09.3	07.6	72	56.0	45.3	132	102.6	83.1	252	149.2	120.8	252	195.8	158.6
13	10.1	08.2	73	56.7	45.9	133	103.4	83.7	253	150.0	121.5	253	196.6	159.2
14	10.9	08.8	74	57.5	46.6	134	104.1	84.3	254	150.8	122.1	254	197.4	159.8
15	11.7	09.4	75	58.3	47.2	135	104.9	85.0	255	151.5	122.7	255	198.2	160.5
16	12.4	10.1	76	59.1	47.8	136	105.7	85.6	256	152.3	123.3	256	198.9	161.1
17	13.2	10.7	77	59.8	48.5	137	106.5	86.2	257	153.1	124.0	257	199.7	161.7
18	14.0	11.3	78	60.6	49.1	138	107.2	86.8	258	153.9	124.6	258	200.5	162.4
19	14.8	12.0	79	61.4	49.7	139	108.0	87.5	259	154.6	125.2	259	201.3	163.8
20	15.5	12.6	80	62.2	50.3	140	108.8	88.1	260	155.4	125.9	260	202.0	163.6
21	16.3	13.2	81	62.9	51.0	141	109.6	88.7	261	156.2	126.5	261	202.8	164.2
22	17.1	13.8	82	63.7	51.6	142	110.3	89.4	262	157.0	127.1	262	203.6	164.9
23	17.9	14.5	83	64.5	52.2	143	111.1	90.0	263	157.8	127.7	263	204.4	165.5
24	18.7	15.1	84	65.3	52.9	144	111.9	90.6	264	158.5	128.4	264	205.2	166.1
25	19.4	15.7	85	66.1	53.5	145	112.7	91.2	265	159.3	129.0	265	205.9	166.8
26	20.2	16.4	86	66.8	54.1	146	113.5	91.9	266	160.1	129.6	266	206.7	167.4
27	21.0	17.0	87	67.6	54.7	147	114.2	92.5	267	160.9	130.3	267	207.5	168.0
28	21.8	17.6	88	68.4	55.4	148	115.0	93.1	268	161.6	130.9	268	208.3	168.7
29	22.5	18.2	89	69.2	56.0	149	115.8	93.8	269	162.4	131.5	269	209.0	169.3
30	23.3	18.9	90	69.9	56.6	150	116.6	94.4	270	163.2	132.2	270	209.8	169.6
31	24.1	19.5	91	70.7	57.3	151	117.3	95.0	271	163.9	132.8	271	210.6	170.5
32	24.9	20.1	92	71.5	57.9	152	118.1	95.7	272	164.7	133.4	272	211.4	171.2
33	25.6	20.8	93	72.3	58.5	153	118.9	96.3	273	16 .6	134.0	273	212.1	171.8
34	26.4	21.4	94	73.0	59.2	154	119.7	96.9	274	166.3	134.7	274	212.9	172.4
35	27.2	22.0	95	73.8	59.8	155	120.5	97.5	275	167.1	135.3	275	213.7	173.1
36	28.0	22.7	96	74.6	60.4	156	121.2	98.2	276	167.9	135.9	276	214.5	173.7
37	28.8	23.3	97	75.4	60.9	157	122.0	98.8	277	168.6	136.6	277	215.3	174.5
38	29.5	23.9	98	76.2	61.7	158	122.8	99.4	278	169.4	137.2	278	216.0	174.9
39	30.3	24.5	99	76.9	62.3	159	123.6	100.1	279	170.2	137.8	279	216.8	175.6
40	31.1	25.2	100	77.7	62.9	160	124.3	100.7	280	171.0	138.4	280	217.6	176.2
41	31.9	25.8	101	78.5	63.6	161	125.1	101.3	281	171.7	139.1	281	218.4	176.8
42	32.6	26.4	102	79.3	64.2	162	125.9	101.9	282	172.5	139.7	282	219.1	177.5
43	33.4	27.1	103	80.0	64.8	163	126.7	102.6	283	173.3	140.3	283	219.9	178.1
44	34.2	27.7	104	80.8	65.4	164	127.4	103.2	284	174.1	141.0	284	220.7	178.7
45	35.0	28.3	105	81.6	66.1	165	128.2	103.8	285	174.8	141.6	285	221.5	179.4
46	35.7	28.9	106	82.4	66.7	166	129.0	104.5	286	175.6	42.2	285	222.3	180.0
47	36.5	29.6	107	83.1	67.3	167	129.8	105.1	287	176.4	142.9	287	223.0	180.6
48	37.3	30.2	108	83.9	68.0	168	130.6	105.7	288	177.2	143.5	288	223.8	181.2
49	38.1	30.8	109	84.7	68.6	169	131.3	106.4	289	178.0	144.1	289	224.6	181.9
50	38.9	31.5	110	85.5	69.2	170	132.1	107.0	290	178.7	144.7	290	225.4	182.5
51	39.6	32.1	111	86.3	69.9	171	132.9	107.6	291	179.5	145.4	291	226.1	183.1
52	40.4	32.7	112	87.0	70.5	172	133.7	108.2	292	180.3	146.0	292	226.0	183.8
53	41.2	33.4	113	87.8	71.1	173	134.4	108.9	293	181.1	146.6	293	227.7	184.4
54	42.0	34.0	114	88.6	71.7	174	135.2	109.5	294	181.8	147.3	294	228.5	185.0
55	42.7	34.6	115	89.4	72.4	175	136.0	110.1	295	182.6	147.9	295	229.2	185.6
56	43.5	35.2	116	90.1	73.0	176	136.8	110.8	296	183.4	148.5	296	230.0	186.3
57	44.3	35.9	117	90.9	73.6	177	137.5	111.4	297	184.2	149.1	297	230.8	186.9
58	45.1	36.5	118	91.7	74.3	178	138.3	112.0	298	185.0	149.8	298	231.6	187.5
59	45.8	37.1	119	92.5	74.9	179	139.1	112.6	299	185.7	150.4	299	232.4	188.2
60	46.6	37.8	120	93.3	75.5	180	139.9	113.3	300	186.5	151.0	300	233.1	188.8
Diſt.	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.

for 51 Degrees.

Difference of Latitude and Departure for 40 Degrees.

Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.	Diſt.	Lat.	Dep.
1	00.8	00.6	61	46.7	39.2	121	92.7	77.8	181	138.6	116.4	241	184.6	154.9
2	01.5	01.3	62	47.5	39.9	122	93.4	78.4	182	139.4	117.0	242	185.4	155.6
3	02.3	01.9	63	48.3	40.5	123	64.2	79.1	183	140.2	117.7	243	186.1	156.2
4	03.1	02.6	64	49.0	41.1	124	95.0	79.7	184	140.9	118.3	244	186.9	156.9
5	03.8	03.2	65	49.8	41.8	125	95.7	80.4	185	141.7	118.9	245	187.7	157.5
6	04.6	03.9	66	50.6	42.4	126	96.5	81.0	186	142.5	119.6	246	188.4	158.1
7	05.4	04.5	67	51.3	43.1	127	97.3	81.6	187	143.2	120.2	247	189.2	158.8
8	06.1	05.1	68	52.1	43.7	128	98.0	82.3	188	144.0	120.9	248	190.0	159.4
9	06.9	05.8	69	52.9	44.4	129	98.8	82.9	189	144.8	121.5	249	190.7	160.1
10	07.7	06.4	70	53.6	45.0	130	99.6	83.6	190	145.5	122.1	250	191.5	160.7
11	08.4	07.1	71	54.4	45.6	131	100.3	84.2	191	146.3	122.8	251	192.3	161.4
12	09.2	07.7	72	55.2	46.3	132	101.1	84.9	192	147.1	123.4	252	193.0	162.0
13	10.0	08.4	73	55.9	46.9	133	101.9	85.5	193	147.8	124.1	253	193.8	162.6
14	10.7	09.0	74	56.7	47.6	134	102.6	86.1	194	148.6	124.7	254	194.6	163.3
15	11.5	09.6	75	57.4	48.2	135	103.4	86.8	195	149.4	125.4	255	195.3	163.9
16	12.3	10.3	76	58.2	48.9	136	104.2	87.4	196	150.1	126.0	256	196.1	164.6
17	13.0	10.9	77	59.0	49.5	137	104.9	88.1	197	150.9	126.6	257	196.9	165.2
18	13.8	11.6	78	59.7	50.1	138	105.7	88.7	198	151.7	127.3	258	197.6	165.9
19	14.6	12.2	79	60.5	50.8	139	106.5	89.4	199	152.4	127.9	259	198.4	166.5
20	15.3	12.9	80	61.3	51.4	140	107.2	90.0	200	153.2	128.6	260	199.2	167.1
21	16.1	13.5	81	62.0	52.1	141	108.0	90.6	201	154.0	129.2	261	199.9	167.8
22	16.9	14.1	82	62.8	52.7	142	108.8	91.3	202	154.7	129.9	262	200.7	168.4
23	17.6	14.8	83	63.6	3.4	143	109.5	91.9	203	155.5	130.5	263	201.4	169.1
24	18.4	15.4	84	64.3	54.0	144	110.3	92.6	204	156.3	131.1	264	202.2	169.7
25	19.2	16.1	85	65.1	54.6	145	111.1	93.2	205	157.0	131.8	265	203.0	170.4
26	19.9	16.7	86	65.9	55.3	146	111.8	93.9	206	157.8	132.4	266	203.7	171.0
27	20.7	17.4	87	66.6	55.9	147	112.6	94.5	207	158.6	133.1	267	204.5	171.6
28	21.4	18.0	88	67.4	56.6	148	113.4	95.1	208	159.3	133.7	268	205.3	172.3
29	22.2	18.6	89	68.2	57.2	149	114.6	95.8	209	160.1	134.4	269	206.0	172.9
30	23.0	19.3	90	68.9	57.9	150	114.9	95.4	210	160.9	135.0	270	206.8	173.6
31	23.7	19.9	91	69.7	58.5	151	115.7	97.1	211	161.6	135.6	271	207.6	174.2
32	24.5	20.6	92	70.5	59.1	152	116.4	97.7	212	162.4	136.3	272	208.3	174.8
33	25.3	21.2	93	71.2	59.8	153	117.2	98.4	213	163.2	136.9	273	209.1	175.5
34	26.0	21.9	94	72.0	60.4	154	118.0	99.0	214	163.9	137.6	274	209.9	176.1
35	26.8	22.5	95	72.8	61.1	155	118.7	99.6	215	164.7	138.2	275	210.6	176.8
36	27.6	23.1	96	73.5	61.7	156	119.5	100.3	216	65.4	138.8	276	211.4	177.4
37	28.3	23.8	97	74.3	62.4	157	120.3	100.9	217	166.2	139.5	277	212.2	178.1
38	29.1	24.4	98	75.1	63.0	158	121.0	101.6	218	167.0	140.1	278	212.9	178.7
39	29.9	25.1	99	75.8	63.6	159	121.8	102.2	219	167.7	140.8	279	213.7	179.3
40	30.6	25.7	100	76.6	64.3	160	122.6	102.8	220	168.5	141.4	280	214.5	180.0
41	31.4	26.4	101	77.4	64.9	161	123.3	103.5	221	169.3	142.1	281	215.2	180.6
42	32.2	27.0	102	78.1	65.6	162	124.1	104.1	222	170.0	142.7	282	216.0	181.3
43	32.9	27.6	103	78.9	66.2	163	124.9	104.8	223	170.8	143.3	283	216.8	181.9
44	33.7	28.3	104	79.7	66.8	164	125.6	105.4	224	171.6	144.0	284	217.5	182.6
45	34.5	28.9	105	80.4	67.5	165	126.4	106.1	225	172.3	144.6	285	218.3	183.2
46	35.2	29.6	106	81.2	68.1	166	127.2	106.7	226	173.1	145.3	286	219.1	183.9
47	36.0	30.2	107	82.0	68.8	167	127.9	107.3	227	173.9	145.9	287	219.8	184.5
48	36.8	30.8	108	82.7	69.4	168	128.7	108.0	228	174.6	146.6	288	220.6	185.1
49	37.5	31.5	109	83.5	70.1	169	129.4	108.6	229	175.4	147.2	289	221.4	185.8
50	38.3	32.1	110	84.3	70.7	170	130.2	109.3	230	176.2	147.9	290	222.1	186.4
51	39.1	32.8	111	85.0	71.3	171	131.0	109.9	231	176.9	148.5	291	222.9	187.1
52	39.8	33.4	112	85.8	72.0	172	131.7	110.6	232	177.7	149.1	292	223.7	187.7
53	40.6	34.1	113	86.6	72.6	173	132.5	111.2	233	178.5	149.8	293	224.4	188.4
54	41.4	34.7	114	87.3	73.3	174	133.3	111.9	234	179.2	150.4	294	225.2	189.0
55	42.1	35.3	115	88.1	73.9	175	134.0	112.5	235	180.0	151.1	295	226.0	189.6
56	42.9	36.0	116	88.9	74.6	176	134.8	113.1	236	180.8	151.7	296	226.7	190.3
57	43.7	36.6	117	89.6	75.2	177	135.6	113.8	237	181.5	152.4	297	227.5	190.9
58	44.4	37.3	118	90.4	75.9	178	136.3	114.4	238	182.3	153.0	298	228.3	191.6
59	45.2	37.6	119	91.2	76.5	179	137.1	115.1	239	183.1	153.6	299	229.0	192.2
60	46.0	38.6	120	91.9	77.1	180	137.9	115.7	240	183.8	154.3	300	229.8	192.9
Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.	Diſt.	Dep.	Lat.

For 50 Degrees.

Difference of Latitude and Departure for 41 Degrees.

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	00.8	00.7	61	46.0	40.0	121	91.3	79.4	181	136.6	118.7	241	181.9	158,1
2	01.5	01.3	62	46.8	40.7	122	92.1	80.0	182	137.4	119.4	242	182.6	158.7
3	02.3	02.0	63	47.5	41.3	123	92,8	80,7	183	138.1	120.0	243	183.4	159,4
4	03.0	02.6	64	48.3	42.0	124	93.6	81.3	184	138.9	120.7	244	184.2	160,0
5	03.8	03.3	65	49.1	42.6	125	94.3	82.0	185	139.6	121.4	245	184.9	160,7
6	04.5	03.9	66	49.8	43.3	126	95.1	82.6	186	140.4	122.0	246	185.7	161,4
7	05.3	04.6	67	50.6	44.0	127	95.8	83.3	187	141.1	122.7	247	186.4	162,0
8	06.0	05.2	68	51.3	44.6	128	96.6	84.0	188	141.9	123.3	248	187.2	162,7
9	06.8	05.9	69	52.1	45.3	129	97.4	84.6	189	142.6	124.0	249	187.9	163,3
10	07.5	06.6	70	52.8	45.9	130	98.1	85.3	190	143.4	124.6	250	188.7	164,0
11	08.3	07.2	71	53.6	46.6	131	98.9	85.9	191	144.2	125.3	251	189.4	164,6
12	09.1	07.9	72	54.3	47.2	132	99.6	86.6	192	144.9	125.9	252	190.2	165,3
13	09.8	08.5	73	55.1	47.9	133	100.4	87.2	193	145.7	126.6	253	190.9	166,0
14	10.6	09.2	74	55.8	48.5	134	101.1	87.9	194	146.4	127.3	254	191.7	166,6
15	11.3	09.8	75	56.6	49.2	135	101.9	88.6	195	147.2	127.9	255	192.5	167.3
16	12.1	10.5	76	57.3	49.9	136	102.6	89.2	196	147.9	128.6	256	193.2	167,9
17	12.8	11.2	77	58.1	50.5	137	103.4	89.9	197	148.7	129.2	257	194.0	168,6
18	13.6	11.8	78	58.8	51.2	138	104.2	90.5	198	149.4	129.9	258	194.7	169,2
19	14.3	12.5	79	59.6	51.8	139	104.9	91.2	199	150.2	130.5	259	195.5	169,9
20	15.1	13.1	80	60.4	52.5	140	105.7	91.8	200	150.9	131.2	260	196.2	170,5
21	15.8	13.8	81	61.1	53.1	141	106.4	92.5	201	151.7	131.8	261	197.0	171,2
22	16.6	14.4	82	61.9	53.8	142	107.2	93.1	202	152.5	132.5	262	197.7	171,9
23	17.4	15.1	83	62.6	54.4	143	107.9	93.8	203	153.2	133.2	263	198.5	172,5
24	18.1	15.7	84	63.4	55.1	144	108.7	94.5	204	154.0	133.8	264	199.2	173,2
25	18.9	16.4	85	64.2	55.8	145	109.4	95.1	205	154.7	134.5	265	200.0	173,8
26	19.6	17.1	86	64.9	56.4	146	110.2	95.8	206	155.5	135.1	266	200.8	174,5
27	20.4	17.7	87	65.7	57.1	147	110.9	96.4	207	156.2	135.8	267	201.5	175,1
28	21.1	18.4	88	66.4	57.7	148	111.7	97.1	208	157.0	136.4	268	202.3	175,8
29	21.9	19.0	89	67.2	58.4	149	112.5	97.7	209	157.7	137.1	269	203.0	176,4
30	22.6	19.7	90	67.9	59.0	150	113.2	98.4	210	158.5	137.7	270	203.8	177,1
31	23.4	20.3	91	68.7	59.7	151	114.0	99.0	211	159.2	138.4	271	204.5	177,8
32	24.2	21.0	92	69.4	60.4	152	114.7	99.7	212	160.0	139.1	272	205.3	178,4
33	24.9	21.6	93	70.2	61.0	153	115.5	100.4	213	160.8	139.7	273	206.0	179,1
34	25.7	22.3	94	70.9	61.7	154	116.2	101.0	214	161.5	140.4	274	206.8	179,7
35	26.4	23.0	95	71.7	62.3	155	117.0	101.7	215	162.3	141.0	275	207.5	180,4
36	27.2	23.6	96	72.5	63.0	156	117.7	102.3	216	163.0	141.7	276	208.3	181,0
37	27.9	24.3	97	73.2	63.6	157	118.5	103.0	217	163.8	142.3	277	209.1	181,7
38	28.7	24.9	98	74.0	64.3	158	119.2	103.6	218	164.5	143.0	278	209.8	182.4
39	29.4	25.6	99	74.7	64.9	159	120.0	104.3	219	165.3	143.6	279	210.6	183,0
40	30.2	26.2	100	75.5	65.6	160	120.8	105.0	220	166.0	144.3	280	211.3	183.7
41	30.9	26.9	101	76.2	66.3	161	121.5	105.6	221	166.8	45.0	281	212.1	184.3
42	31.7	27.6	102	77.0	66.9	162	122.3	106.3	222	167.5	145.6	282	212.8	185.0
43	32.5	28.2	103	77.7	67.6	163	123.0	106.9	223	168.3	146.3	283	213.6	185.6
44	33.2	28.9	104	78.5	68.2	164	123.8	107.6	224	169.1	146.9	284	214.3	186.3
45	34.0	29.5	105	79.2	68.9	165	124.5	108.2	225	169.8	147.6	285	215.1	186.9
46	34.7	30.2	106	80.0	69.5	166	125.3	108.9	226	170.6	148.2	286	215.8	187.6
47	35.5	30.8	107	80.8	70.2	167	126.0	109.5	227	171.3	148.9	287	216.6	188.3
48	36.2	31.5	108	81.5	70.8	168	126.8	110.2	228	172.1	149.6	288	217.4	188.9
49	37.0	32.1	109	82.3	71.5	169	127.5	110.9	229	172.8	150.2	289	218.1	189.6
50	37.7	32.8	110	83.0	72.2	170	128.3	111.5	230	173.6	150.9	290	218.9	190.3
51	38.5	33.5	111	83.8	72.8	171	129.1	112.2	231	174.3	151.5	291	219.6	190.9
52	39.2	34.1	112	84.5	73.5	172	129.8	112.8	232	175.1	152.2	292	220.4	191.5
53	40.0	34.8	113	85.3	74.1	173	130.6	113.5	233	175.8	152.8	293	221.1	192.2
54	40.8	35.4	114	86.0	74.8	174	131.3	114.1	234	176.6	153.5	294	221.9	192.8
95	41.5	36.1	115	86.8	75.5	175	132.1	114.8	235	177.4	154.1	295	222.6	193.5
56	42.3	36.7	116	87.5	76.3	176	132.8	115.4	236	178.1	154.8	296	223.4	194.2
57	43.0	37.4	117	88.3	77.1	177	133.6	116.1	237	178.9	155.5	297	224.2	194.8
58	43.8	38.0	118	89.1	77.4	178	134.3	116.8	238	179.6	156.1	298	224.9	195.5
59	44.5	38.7	119	89.8	78.1	179	135.1	117.4	239	180.4	156.8	299	225.7	196.1
60	45.3	39.4	120	90.6	78.7	180	135.8	118.1	240	181.1	157.4	300	226.4	196.8
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

for 49 Degrees.

Difference of Latitude and Departure for 42 Degrees.

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	00.7	00.7	61	45.3	40.8	121	89.9	80.9	181	134.5	121.1	241	179.0	161.2
2	01.5	01.3	62	46.1	41.5	122	90.6	81.6	182	135.2	121.8	242	179.8	161.9
3	02.2	02.0	63	46.8	42.1	123	91.4	82.3	183	135.9	122.4	243	180.5	162.6
4	03.0	02.7	64	47.5	42.8	124	92.1	83.0	184	136.7	123.1	244	181.3	163.2
5	03.7	03.3	65	48.3	43.5	125	92.9	83.6	185	137.3	123.8	245	182.0	163.9
6	04.5	04.0	66	49.0	44.2	126	93.6	84.3	186	138.2	124.4	246	182.8	164.6
7	05.2	04.7	67	49.8	44.8	127	94.3	85.0	187	138.9	125.1	247	183.5	165.2
8	05.9	05.4	68	50.5	45.5	128	95.1	85.6	188	139.7	125.8	248	184.2	165.9
9	06.7	06.0	69	51.3	46.2	129	95.8	86.3	185	140.4	126.4	249	185.0	166.6
10	07.4	06.7	70	52.0	46.8	130	96.6	87.0	190	141.1	127.1	250	185.7	167.2
11	08.2	07.4	71	52.7	47.5	131	97.3	87.6	191	141.9	127.8	251	186.5	167.9
12	08.9	08.0	72	53.5	48.2	132	98.1	88.3	192	142.6	128.4	252	187.2	168.6
13	09.7	08.7	73	54.2	48.8	133	98.8	89.0	193	143.4	129.1	253	187.9	169.3
14	10.4	09.4	74	55.0	49.5	134	99.5	89.6	194	143.1	129.8	254	188.7	169.9
15	11.1	10.0	75	55.7	50.2	135	100.3	90.3	195	144.9	130.5	255	189.4	170.6
16	11.9	10.7	76	56.5	50.8	136	101.0	91.0	196	145.6	131.1	256	190.2	171.3
17	12.6	11.4	77	57.2	51.5	137	101.8	91.7	197	146.3	131.8	257	190.9	171.9
18	13.4	12.0	78	57.9	52.2	148	102.5	92.3	198	147.1	132.5	258	191.7	172.6
19	14.1	12.7	79	58.7	52.9	139	103.3	93.0	199	147.8	133.1	259	192.4	173.3
20	14.9	13.4	80	59.4	53.5	140	104.0	93.7	200	148.6	133.8	260	193.1	173.9
21	15.6	14.0	81	60.2	54.2	141	104.7	94.3	201	149.3	134.5	261	193.9	174.6
22	16.3	14.7	82	60.9	54.9	142	105.5	95.0	202	150.1	135.1	262	194.6	175.3
23	17.1	15.4	83	61.7	55.5	143	106.2	95.7	203	150.8	135.8	263	195.4	176.0
24	17.8	16.0	84	62.4	56.2	144	107.0	96.3	204	151.5	136.5	264	196.1	176.6
25	18.6	16.7	85	63.1	56.9	145	107.7	97.0	205	152.3	137.1	265	196.9	177.3
26	19.3	17.4	86	63.9	57.5	146	108.5	97.7	206	153.0	137.8	266	197.6	177.9
27	20.1	18.1	87	64.6	58.2	147	109.2	98.3	207	153.8	138.5	267	198.3	178.6
28	20.8	18.7	88	65.4	58.9	148	109.9	99.0	208	154.5	139.1	268	199.1	179.3
29	21.5	19.4	89	66.1	59.5	149	110.7	99.7	209	155.3	139.8	269	199.8	180.0
30	22.3	20.1	90	66.9	60.2	150	111.4	100.4	210	156.0	140.5	270	200.6	180.6
31	23.0	20.7	91	67.6	60.9	151	112.2	101.0	211	156.7	141.2	271	201.3	181.3
32	23.8	21.4	92	68.3	61.5	152	112.9	101.7	212	157.5	141.8	272	202.1	182.0
33	24.5	22.1	93	69.1	62.2	153	113.7	102.4	213	158.2	142.5	273	202.8	182.6
34	25.3	22.7	94	69.8	62.9	154	114.4	103.0	214	159.0	143.2	274	203.5	183.3
35	26.0	23.4	95	70.6	63.6	155	115.1	103.7	215	159.7	143.8	275	204.3	184.0
36	26.7	24.1	96	71.3	64.2	156	115.9	104.4	216	160.5	144.5	276	205.0	184.6
37	27.5	24.8	97	72.1	64.9	157	116.6	105.0	217	161.2	145.2	277	205.8	185.3
38	28.2	25.4	98	72.8	65.6	158	117.4	105.7	218	161.9	145.8	278	206.5	186.0
39	29.0	26.1	99	73.5	66.2	159	118.1	106.4	219	162.7	146.5	279	207.3	186.6
40	29.7	26.8	100	74.3	66.9	160	118.9	107.0	220	163.4	147.2	280	208.0	187.3
41	30.5	27.4	101	75.0	67.6	161	119.6	107.7	221	164.2	147.8	281	208.7	188.0
42	31.2	28.1	102	75.8	68.2	162	120.3	108.4	222	164.9	148.5	282	209.5	188.7
43	31.9	28.8	103	76.5	68.9	163	121.1	109.0	223	165.7	149.2	283	210.2	189.3
44	32.7	29.4	104	77.3	69.6	164	121.8	109.7	224	166.4	149.9	284	211.0	190.0
45	33.4	30.1	105	78.0	70.2	165	122.6	110.4	225	167.1	150.5	285	211.7	190.7
46	34.2	30.8	106	78.7	70.9	166	123.3	111.0	226	167.9	151.2	286	212.5	191.3
47	34.9	31.4	107	79.5	71.6	167	124.1	111.7	227	168.6	151.9	287	213.2	192.0
48	35.7	32.1	108	80.2	72.3	168	124.8	112.4	228	169.4	152.5	288	213.9	192.7
49	36.4	32.8	109	81.0	72.9	169	125.5	113.1	229	170.1	153.2	289	214.7	193.3
50	37.1	33.5	110	81.7	73.6	170	126.3	113.7	230	170.9	153.9	290	215.4	194.0
51	37.9	34.1	111	82.5	74.3	171	127.0	114.4	231	171.6	154.5	291	216.2	194.7
52	38.6	34.8	112	83.2	74.9	172	127.8	115.1	232	172.3	155.2	292	216.9	195.3
53	39.4	35.5	113	83.9	75.6	173	128.5	115.7	233	173.1	155.9	293	217.7	196.0
54	40.1	36.1	114	84.7	76.3	174	129.3	116.4	234	173.8	156.5	294	218.4	196.7
55	40.9	36.8	115	85.4	76.9	175	130.0	117.1	235	174.6	157.2	295	219.1	197.4
56	41.6	37.5	116	86.2	77.6	176	130.7	117.7	236	175.5	157.9	296	219.9	198.0
57	42.3	38.1	117	86.9	78.3	177	131.5	118.4	237	176.1	158.5	297	220.6	198.7
58	43.1	38.8	118	87.7	78.9	178	132.2	119.1	238	176.8	159.2	298	221.4	199.4
59	43.8	39.5	119	88.4	79.6	179	133.0	119.7	239	177.5	159.9	299	222.1	200.1
60	44.6	40.1	120	89.1	80.2	180	133.7	120.4	240	178.3	160.6	300	222.9	200.8
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

for 48 Degrees.

Difference of Latitude and Departure for 43 Degrees.

Diſt.	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.	Diſt	Lat.	Dep.
1	00.7	00.7	61	44.6	41.6	121	88.5	82.5	181	132.4	123.4	241	176.3	164.3
2	01.5	01.4	62	45.3	42.3	122	89.2	83.2	182	133.1	124.1	242	177.0	195.0
3	02.2	02.0	63	46.1	43.0	123	90.0	83.9	183	133.8	124.8	243	177.7	165.7
4	02.9	02.7	64	46.8	43.6	124	90.7	84.5	184	134.6	125.5	244	178.4	166.4
5	03.7	03.4	65	47.5	44.3	125	91.4	85.2	185	135.3	126.2	245	179.2	167.1
6	04.4	04.1	66	48.3	45.0	122	92.1	85.9	186	136.0	126.8	246	179.9	167.7
7	05.1	04.8	67	49.0	45.7	127	92.9	86.6	187	136.8	127.5	247	180.6	168.4
8	05.9	05.5	68	49.7	46.4	128	93.6	87.3	188	137.5	128.2	248	181.4	169.1
9	06.6	06.2	69	50.5	47.1	129	94.3	88.0	189	138.2	128.9	249	182.1	169.8
10	07.3	06.8	70	51.2	47.7	130	95.1	88.6	190	139.0	129.5	250	182.8	170.5
11	08.0	07.5	71	51.9	48.4	131	95.8	89.3	191	139.7	130.2	251	183.6	171.2
12	08.8	08.2	72	52.7	49.1	132	96.5	90.0	192	140.4	130.9	252	184.3	171.8
13	09.5	08.9	73	53.4	49.8	133	97.3	90.7	193	141.1	131.6	253	185.0	172.5
14	10.2	09.5	74	54.1	50.5	134	98.0	91.4	194	141.9	132.3	254	185.8	173.2
15	11.0	10.2	75	54.9	51.2	135	98.7	92.1	195	142.6	133.0	255	186.5	173.9
16	11.7	10.9	76	55.6	51.8	136	99.5	92.7	196	143.3	133.6	256	187.2	174.5
17	12.4	11.6	77	56.3	52.5	137	100.2	43.4	197	144.1	134.3	257	187.9	175.2
18	13.2	12.3	78	57.0	53.2	138	100.9	94.1	198	144.8	135.0	258	188.7	175.9
19	13.9	13.0	79	57.8	53.9	139	101.7	94.8	199	145.5	135.7	259	189.4	176.6
20	14.6	13.6	80	58.5	54.5	140	102.4	95.5	100	146.3	136.4	260	190.1	177.3
21	15.4	14.3	81	59.2	55.2	141	103.1	96.2	101	147.0	137.1	261	190.9	178.0
22	16.1	15.0	82	60.0	55.9	142	103.9	96.8	102	147.7	137.7	262	191.6	178.6
23	16.8	15.7	83	60.7	56.6	143	104.6	97.5	103	148.5	138.4	263	192.3	179.3
24	17.6	16.4	84	61.4	57.3	144	105.3	98.2	104	149.2	139.1	264	193.1	180.0
25	18.3	17.1	85	62.2	58.0	145	106.0	98.9	105	149.9	139.8	265	193.8	180.7
26	19.0	17.7	86	62.9	58.6	146	106.8	99.5	106	150.7	140.5	266	194.5	181.4
27	19.7	18.4	87	63.6	59.3	147	107.5	100.2	107	151.4	141.2	267	195.3	182.1
28	20.5	19.1	88	64.4	60.0	148	108.2	100.9	108	152.2	141.8	268	196.0	182.7
29	21.2	19.8	89	65.1	60.7	149	109.0	101.6	109	152.9	142.5	269	196.7	183.4
30	21.9	20.5	90	65.8	61.4	150	109.7	102.3	110	153.6	143.2	270	197.5	184.1
31	22.7	21.2	91	66.2	62.3	151	110.4	103.0	211	154.3	143.9	271	198.2	184.8
32	23.4	21.8	92	67.3	62.7	152	111.2	103.6	212	155.0	144.5	272	198.9	185.5
33	24.1	22.5	93	68.0	63.4	153	111.9	104.3	213	155.8	145.2	273	199.7	186.2
34	24.9	23.2	94	68.7	64.1	154	112.6	105.0	214	156.5	145.9	274	200.4	186.8
35	25.6	23.9	95	69.5	64.8	155	113.4	105.7	215	157.2	146.6	275	201.1	187.5
36	26.3	24.5	96	70.2	65.5	156	114.1	106.4	216	158.0	147.3	276	201.9	188.2
37	27.1	25.2	97	70.9	66.2	157	114.8	107.1	217	158.7	148.0	277	202.6	188.9
38	27.8	25.9	98	71.7	66.8	158	115.6	107.7	218	159.4	148.6	278	203.3	189.5
39	28.5	26.6	99	72.4	67.5	159	116.3	108.4	219	160.2	149.3	279	204.0	190.2
40	29.3	27.3	100	73.1	68.2	160	117.0	109.1	220	160.9	150.0	280	204.8	190.9
41	30.0	28.0	101	73.9	68.9	161	117.7	109.8	221	161.6	150.7	281	205.5	191.6
42	30.7	28.6	102	74.9	69.5	162	118.5	110.5	222	162.4	151.4	282	206.2	192.3
43	31.4	29.3	103	75.3	70.2	163	119.2	111.2	223	163.1	152.1	283	207.0	193.0
44	32.2	30.0	104	76.1	70.9	164	119.9	111.8	224	163.8	152.7	284	207.7	193.6
45	32.9	30.7	105	76.8	71.6	165	120.7	112.5	225	164.6	153.4	285	208.4	194.3
46	33.6	31.4	106	77.5	72.3	166	121.4	113.2	226	165.3	154.1	286	209.2	195.0
47	34.4	32.1	107	78.3	73.0	167	122.1	113.9	227	166.0	154.8	287	209.9	195.7
48	35.1	32.7	108	79.0	73.6	168	122.9	114.5	228	166.7	155.5	288	210.6	196.4
49	35.8	33.4	109	79.7	74.3	169	123.6	115.3	229	167.5	156.2	289	211.4	197.1
50	36.6	34.1	110	80.4	75.0	170	124.3	115.9	230	168.2	156.8	290	212.1	197.7
51	37.3	34.8	111	81.2	75.7	171	125.1	116.6	231	168.9	157.5	291	212.8	198.4
52	38.0	35.5	112	81.9	76.4	172	125.8	117.3	232	169.7	158.2	292	213.6	199.1
53	38.8	36.2	113	82.6	77.1	173	126.5	118.0	233	170.4	158.9	293	214.3	199.8
54	39.5	36.8	114	83.4	77.7	174	127.3	118.6	234	171.1	159.5	294	215.0	200.5
55	40.2	37.5	115	84.1	78.4	175	128.0	119.3	235	171.9	160.2	295	215.7	201.2
56	41.0	38.2	116	84.8	79.1	176	128.7	120.0	236	172.6	160.9	296	216.5	201.8
57	41.7	38.9	117	85.6	79.8	177	129.4	120.7	237	173.3	161.6	297	217.2	202.5
58	42.4	39.5	118	86.3	80.5	178	130.2	121.4	238	174.1	162.3	298	218.0	203.2
59	43.1	40.2	119	87.0	81.2	179	130.9	122.1	239	174.8	163.0	299	218.7	203.9
60	43.9	40.9	120	87.8	81.8	180	131.6	122.7	240	175.5	163.6	300	219.4	204.6
Diſt.	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.	Diſt	Dep.	Lat.

for 47 Degrees.

Difference of Latitude and Departure for 44 Degrees.

Dift.	Lat.	Dep.	Dift	Lat.	Dep.	Dift	Lat.	Dep.	Dift	Lat.	Dep.	Dift	Lat.	Dep.
1	00.7	00.7	61	43.9	42.4	121	87.0	84.0	181	130.2	125.7	241	173.4	167.4
2	01.4	01.4	62	44.6	43.1	122	87.8	84.7	182	130.9	126.4	242	174.1	168.1
3	02.2	02.1	63	45.3	43.8	123	88.5	85.4	183	131.6	127.1	243	174.8	168.8
4	02.9	02.8	64	46.0	44.5	124	89.2	86.1	184	132.4	127.8	244	175.5	169.5
5	03.6	03.5	65	46.8	45.1	125	89.9	86.8	185	133.1	128.5	245	176.2	170.2
6	04.3	04.2	66	47.7	45.8	126	90.6	87.5	186	133.8	129.2	246	176.9	170.9
7	05.0	04.9	67	48.2	46.5	127	91.4	88.2	187	134.5	129.9	247	177.7	171.6
8	05.8	05.6	68	48.9	47.2	128	92.1	88.9	188	135.2	130.6	248	178.4	172.3
9	06.5	06.3	69	49.6	47.9	129	92.8	89.6	189	135.9	131.3	249	179.1	173.0
10	07.2	06.9	70	50.4	48.6	130	93.5	90.3	190	136.7	132.0	250	179.8	173.6
11	07.9	07.6	71	51.1	49.3	131	94.2	91.0	191	137.4	132.7	251	180.5	174.3
12	08.6	08.3	72	51.8	50.0	132	94.9	91.7	192	138.1	133.4	252	181.3	175.0
13	09.4	09.0	73	52.5	50.7	133	95.7	92.4	193	138.8	134.1	253	182.0	175.7
14	10.1	09.7	74	53.2	51.4	134	96.4	93.1	194	139.5	134.8	254	182.7	176.4
15	10.8	10.4	75	53.9	52.1	135	97.1	93.8	195	140.3	135.4	255	183.4	177.1
16	11.5	11.1	76	54.7	52.8	136	97.8	94.5	196	141.0	136.1	256	184.2	177.8
17	12.2	11.8	77	55.4	53.5	137	98.5	95.2	197	141.7	136.8	257	184.9	178.5
18	12.9	12.5	78	56.1	54.2	138	99.3	95.9	198	142.4	137.5	258	185.6	179.2
19	13.7	13.2	79	56.8	54.9	139	100.0	96.5	199	143.1	138.2	259	186.3	179.9
20	14.4	13.9	80	57.5	55.6	140	100.7	97.2	200	143.9	138.9	260	187.0	180.6
21	15.1	14.6	81	58.3	56.3	141	101.4	97.9	201	144.6	139.6	261	187.7	181.3
22	15.8	15.3	82	59.0	57.0	142	102.1	98.6	202	145.3	140.3	262	188.4	182.0
23	16.5	16.0	83	59.7	57.7	143	102.9	99.3	203	146.0	141.0	263	189.2	182.7
24	17.3	16.7	84	60.4	58.3	144	103.6	100.0	204	146.7	141.7	264	189.9	183.4
25	18.0	17.4	85	61.1	59.0	145	104.3	100.7	205	147.5	142.4	265	190.6	184.1
26	18.7	18.1	86	61.9	59.7	146	105.0	101.4	206	148.2	143.1	266	191.3	184.8
27	19.4	18.8	87	62.6	60.4	147	105.7	102.1	207	148.9	143.8	267	192.1	185.5
28	20.1	19.4	88	63.3	61.1	148	106.5	102.8	208	149.6	144.5	268	192.8	186.1
29	20.9	20.1	89	64.0	61.8	149	107.2	103.5	209	150.3	145.2	269	193.5	186.8
30	21.6	20.8	90	64.7	62.5	150	107.9	104.2	210	151.1	145.9	270	194.2	187.6
31	22.3	21.5	91	65.5	63.2	151	108.6	104.9	211	151.8	146.6	271	194.9	188.3
32	23.0	22.2	92	66.2	63.9	152	109.3	105.6	212	152.5	147.3	272	195.6	189.0
33	23.7	22.9	93	66.9	64.6	153	110.1	106.3	213	153.2	147.9	273	196.4	189.6
34	24.5	23.6	94	67.6	65.3	154	110.8	107.0	214	153.9	148.6	274	197.1	190.3
35	25.2	24.3	95	68.3	66.0	155	111.5	107.7	215	154.6	149.3	275	197.8	191.0
36	25.9	25.0	96	69.1	66.7	156	112.2	108.4	216	155.4	150.0	276	198.5	191.7
37	26.6	25.7	97	69.8	67.4	157	112.9	109.1	217	156.1	150.7	277	199.2	192.4
38	27.3	26.4	98	70.5	68.1	158	113.1	109.7	218	156.8	151.4	278	200.0	193.1
39	28.1	27.1	99	71.2	68.8	159	114.4	110.4	219	157.5	152.1	279	200.7	193.8
40	28.8	27.8	100	71.9	69.5	160	115.1	111.1	220	158.2	152.8	280	201.4	194.5
41	29.5	28.5	101	72.6	70.2	161	115.8	111.8	221	159.0	153.5	281	202.1	195.2
42	30.2	29.2	102	73.4	70.8	162	116.5	112.5	222	159.7	154.2	282	202.8	195.9
43	30.9	29.9	103	74.1	71.5	163	117.2	113.2	223	160.4	154.9	283	203.6	196.6
44	31.6	30.6	104	74.8	72.2	164	118.0	113.9	224	161.1	155.6	284	204.3	197.3
45	32.4	31.3	105	75.5	72.9	165	118.7	114.6	225	161.8	156.3	285	205.0	198.0
46	33.1	32.0	106	76.2	73.6	166	119.4	115.3	226	162.6	157.0	286	205.7	198.7
47	33.8	32.6	107	77.0	74.3	167	120.1	116.0	227	163.3	157.7	287	206.4	199.3
48	34.5	33.3	108	77.7	75.0	168	120.8	116.7	228	164.0	158.4	288	207.2	200.0
49	35.2	34.0	109	78.4	75.7	169	121.6	117.4	229	164.7	159.1	289	207.9	200.7
50	36.0	34.7	110	79.1	76.4	170	122.3	118.1	230	165.4	159.8	290	208.6	201.4
51	36.7	35.4	111	79.8	77.1	171	123.0	118.8	231	166.2	160.4	291	209.3	202.1
52	37.4	36.1	112	80.6	77.8	172	123.7	119.5	232	166.9	161.1	292	210.0	202.8
53	38.1	36.8	113	81.3	78.5	173	124.4	120.2	233	167.6	161.8	293	210.8	203.5
54	38.8	37.5	114	82.0	79.2	174	125.2	120.9	234	168.3	162.5	294	211.5	204.2
55	39.6	38.2	115	82.7	79.9	175	125.9	121.6	235	169.0	163.2	295	212.2	204.9
56	40.3	38.9	116	83.4	80.6	176	126.6	122.3	236	169.8	163.9	296	212.9	205.6
57	41.0	39.6	117	84.2	81.3	177	127.3	122.9	237	170.5	164.6	297	213.6	206.3
58	41.7	40.3	118	84.9	82.0	178	128.0	123.6	238	171.2	165.3	298	214.4	207.0
59	42.4	41.0	119	85.6	82.7	179	128.8	124.3	239	171.9	166.0	299	215.1	207.7
60	43.2	41.7	120	86.3	83.4	180	129.5	125.0	240	172.6	166.7	300	215.8	208.4
Dift.	Dep.	Lat.	Dift	Dep.	Lat.	Dift	Dep.	Lat.	Dift	Dep.	Lat.	Dift	Dep	Lat.

for 46 Degrees.

Difference of Latitude and Departure for 45 Degrees.

Dist.	Lat.	Dep	Dist	Lat	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep.	Dist	Lat.	Dep
1	00.7	00.7	61	43.1	43.1	121	85.6	85.6	181	128.0	128.0	181	170.4	170.4
2	01.4	01.4	62	43.8	43.8	122	86.3	86.3	182	128.7	128.7	182	171.2	171.1
3	02.1	02.1	63	44.5	44.5	123	87.0	87.0	183	129.4	129.4	183	171.8	171.8
4	02.8	02.8	64	45.3	45.3	124	87.7	87.7	184	130.1	130.1	184	172.5	172.5
5	03.5	03.5	65	46.0	46.0	125	88.4	88.4	185	130.8	130.8	185	173.2	173.2
6	04.2	04.2	66	46.7	46.7	126	89.1	89.1	186	131.5	131.5	186	173.9	173.9
7	04.9	04.9	67	47.4	47.4	127	89.8	89.8	187	132.1	132.1	187	174.6	174.6
8	05.7	05.7	68	48.1	48.1	128	90.5	90.5	188	132.9	132.9	188	175.4	175.4
9	06.4	06.4	69	48.8	48.8	129	91.2	91.2	189	133.6	133.6	189	176.1	176.1
10	07.1	07.1	70	49.5	49.5	130	91.9	91.9	190	134.3	134.3	190	176.8	176.8
11	07.8	07.8	71	50.2	50.2	131	92.6	92.6	191	135.1	135.1	191	177.5	177.5
12	08.5	08.5	72	50.9	50.9	132	93.3	93.3	192	135.8	135.8	192	178.2	178.2
13	09.2	09.2	73	51.6	51.6	133	94.0	94.0	193	136.5	136.5	193	178.9	178.9
14	09.9	09.9	74	52.3	52.3	134	94.7	94.7	194	137.2	137.2	194	179.6	179.6
15	10.6	10.6	75	53.0	53.0	135	95.5	95.5	195	137.9	137.9	195	180.3	180.3
16	11.3	11.3	76	53.7	53.7	136	96.2	96.2	196	138.6	138.6	196	181.0	181.0
17	12.0	12.0	77	54.4	54.4	137	96.9	96.9	197	139.3	139.3	197	181.7	181.7
18	12.7	12.7	78	55.2	55.2	138	97.6	97.6	198	140.0	140.0	198	182.4	182.4
19	13.4	13.4	79	55.9	55.9	139	98.3	98.3	199	140.7	140.7	199	183.1	183.1
20	14.1	14.1	80	56.6	56.6	140	99.0	99.0	200	141.4	141.4	200	183.8	183.8
21	14.8	14.8	81	57.3	57.3	141	99.7	99.7	201	142.1	142.1	201	184.5	184.5
22	15.6	15.6	82	58.0	58.0	142	100.4	100.4	202	142.8	142.8	202	185.3	185.3
23	16.3	16.3	83	58.7	58.7	143	101.1	101.1	203	143.5	143.5	203	186.0	186.0
24	17.0	17.0	84	59.4	59.4	144	101.8	101.8	204	144.2	144.2	204	186.7	186.7
25	17.7	17.7	85	60.1	60.1	145	102.5	102.5	205	144.9	144.9	205	187.4	187.4
26	18.4	18.4	86	60.8	60.8	146	103.2	103.2	206	145.7	145.7	206	188.1	188.1
27	19.1	19.1	87	61.5	61.5	147	103.9	103.9	207	146.4	146.4	207	188.8	188.8
28	19.8	19.8	88	62.2	62.2	148	104.6	104.6	208	147.1	147.1	208	189.5	189.5
29	20.5	20.5	89	62.9	62.9	149	105.4	105.4	209	147.8	147.8	209	190.2	190.2
30	21.2	21.2	90	63.6	63.6	150	106.1	106.1	210	148.5	148.5	210	190.9	190.9
31	21.9	21.9	91	64.3	64.3	151	106.8	106.8	211	149.2	149.2	211	191.6	191.6
32	22.6	22.6	92	65.1	65.1	152	107.5	107.5	212	149.9	149.9	212	192.3	192.3
33	23.3	23.3	93	65.8	65.8	153	108.2	108.2	213	150.6	150.6	213	193.0	193.0
34	24.0	24.0	94	66.5	66.5	154	108.9	108.9	214	151.3	151.3	214	193.7	193.7
35	24.7	24.7	95	67.2	67.2	155	109.6	109.6	215	152.0	152.0	215	194.4	194.4
36	25.5	25.5	96	67.9	67.9	156	110.3	110.3	216	152.7	152.7	216	195.2	195.2
37	26.2	26.2	97	68.6	68.6	157	111.0	111.0	217	153.4	153.4	217	195.9	195.9
38	26.9	26.9	98	69.3	69.3	158	111.7	111.7	218	154.1	154.1	218	196.6	196.6
39	27.6	27.6	99	70.0	70.0	159	112.4	112.4	219	154.8	154.8	219	197.3	197.3
40	28.3	28.3	100	70.7	70.7	160	113.1	113.1	220	155.6	155.6	220	198.0	198.0
41	29.0	29.0	101	71.4	71.4	161	113.8	113.8	221	156.3	156.3	221	198.7	198.7
42	29.7	29.7	102	72.1	72.1	162	114.5	114.5	222	157.0	157.0	222	199.4	199.4
43	30.4	30.4	103	72.8	72.8	163	115.3	115.3	223	157.7	157.7	223	200.1	200.1
44	31.1	31.1	104	73.5	73.5	164	116.0	116.0	224	158.4	158.4	224	200.8	200.8
45	31.8	31.8	105	74.2	74.2	165	116.7	116.7	225	159.1	159.1	225	201.5	201.5
46	32.5	32.5	106	74.9	74.9	166	117.4	117.4	226	159.8	159.8	226	202.2	202.2
47	33.2	33.2	107	75.7	75.7	167	118.1	118.1	227	160.5	160.5	227	202.9	202.9
48	33.9	33.9	108	76.4	76.4	168	118.8	118.8	228	161.2	161.2	228	203.6	203.6
49	34.6	34.6	109	77.1	77.1	169	119.5	119.5	229	161.9	161.9	229	204.3	204.3
50	35.4	35.4	110	77.8	77.8	170	120.2	120.2	230	162.6	162.6	230	205.1	205.1
51	36.1	36.1	111	78.5	78.5	171	120.9	120.9	231	163.3	163.3	231	205.8	205.8
52	36.8	36.8	112	79.2	79.2	172	121.6	121.6	232	164.0	164.0	232	206.5	206.5
53	37.5	37.5	113	79.9	79.9	173	122.3	122.3	233	164.7	164.7	233	207.2	207.2
54	38.2	38.2	114	80.6	80.6	174	123.0	123.0	234	165.5	165.5	234	207.9	207.9
55	38.9	38.9	115	81.3	81.3	175	123.7	123.7	235	166.2	166.2	235	208.6	208.6
56	39.6	39.6	116	82.0	82.0	176	124.4	124.4	236	166.9	166.9	236	209.3	209.3
57	40.3	40.3	117	82.7	82.7	177	125.2	125.2	237	167.6	167.6	237	210.0	210.0
58	41.0	41.0	118	83.4	83.4	178	125.9	125.9	238	168.3	168.3	238	210.7	210.7
59	41.7	41.7	119	84.1	84.1	179	126.6	126.6	239	169.0	169.0	239	211.4	211.4
60	42.4	42.4	120	84.8	84.8	180	127.3	127.3	240	169.7	169.7	240	212.1	212.1
Dist.	Dep	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.	Dist	Dep.	Lat.

for 45 Degrees.

TABLE VII. A Table of Meridional Parts.

M	0d	1d.	2d.	3d.	4d.	5d.	6d.	7d.	8d.	9d.	10d	11d	12d	13d	M
0	0	60	140	180	240	300	361	421	482	542	603	664	725	787	0
1	1	61	121	181	241	301	362	422	483	543	604	665	726	788	1
2	2	62	122	182	242	302	363	423	484	544	605	666	727	789	2
3	3	63	123	183	243	303	364	424	485	545	606	667	728	790	3
4	4	64	124	184	244	304	365	425	486	546	607	668	729	791	4
5	5	65	125	185	245	305	366	426	487	547	608	669	730	792	5
6	6	66	126	186	246	306	367	427	488	548	609	670	731	793	6
7	7	67	127	187	247	307	368	428	489	549	610	671	732	794	7
8	8	68	128	188	248	308	369	429	490	550	611	672	733	795	8
9	9	69	129	189	249	309	370	430	491	551	612	673	735	796	9
10	10	70	130	190	250	310	371	431	492	552	613	674	736	797	10
11	11	71	131	191	251	311	372	432	493	553	614	675	737	798	11
12	12	72	132	192	252	312	373	433	494	554	615	676	738	799	12
13	13	73	133	193	253	313	374	434	495	555	616	677	739	800	13
14	14	74	134	194	254	314	375	435	496	556	617	678	740	801	14
15	15	75	135	195	255	315	376	436	497	557	618	679	741	802	15
16	16	76	136	196	256	316	377	437	498	538	619	680	742	803	16
17	17	77	137	197	257	317	378	438	499	559	620	681	743	804	17
18	18	78	138	198	258	318	379	439	500	560	621	682	744	805	18
19	19	79	139	199	259	319	380	440	501	561	622	683	745	806	19
20	20	80	140	200	260	320	381	441	502	562	623	684	746	807	20
21	21	81	141	201	261	321	382	442	503	563	224	685	747	808	21
22	22	82	142	202	262	322	383	443	504	564	625	686	748	809	22
23	23	83	143	203	263	323	384	444	505	566	626	688	749	810	23
24	24	84	144	204	264	324	385	445	506	567	627	689	750	811	24
25	25	85	145	205	265	325	386	446	507	568	628	690	751	812	25
26	26	86	146	206	266	326	387	447	508	569	629	691	752	813	26
27	27	87	147	207	267	327	388	448	509	570	630	692	753	814	27
28	28	88	148	208	268	328	389	449	510	571	632	693	754	816	28
29	29	89	149	209	269	329	390	450	511	572	633	694	755	817	29
30	30	90	150	210	270	330	391	451	512	573	634	695	756	818	30
31	31	91	151	211	271	332	392	452	513	574	635	696	757	819	31
32	32	92	152	212	272	333	393	453	514	575	636	697	758	820	32
33	33	93	153	213	273	334	394	454	515	576	637	698	759	821	33
34	34	94	154	214	274	335	395	455	516	577	638	699	760	822	34
35	35	95	155	215	275	336	396	456	517	578	639	700	761	823	35
36	36	96	156	216	276	337	397	457	518	579	640	701	762	824	36
37	37	97	157	217	277	338	398	458	519	580	641	702	763	825	37
38	38	98	158	218	278	339	399	459	520	581	642	703	764	826	38
39	39	99	159	219	279	340	400	460	521	582	643	704	765	827	39
40	40	100	160	220	289	341	401	461	522	583	644	705	766	828	40
41	41	101	161	221	281	342	402	462	523	584	645	706	767	829	41
42	42	102	162	222	282	343	403	463	524	585	646	707	768	830	42
43	43	103	163	223	283	344	404	464	525	586	647	708	769	831	43
44	44	104	164	224	284	345	405	465	526	587	648	709	770	832	44
45	45	105	165	225	485	346	406	466	527	588	649	710	771	833	45
46	46	106	166	226	286	347	407	467	528	589	650	711	772	834	46
47	47	107	167	227	287	348	408	468	529	590	651	712	773	835	47
48	48	108	168	228	288	349	409	469	530	591	652	713	774	836	48
49	49	109	169	229	289	350	410	470	531	592	653	714	775	837	49
50	50	110	170	230	290	351	411	471	532	593	654	715	776	838	50
51	51	111	171	231	201	352	412	472	533	594	655	716	777	839	51
52	52	112	172	232	292	353	413	473	534	595	656	717	779	840	52
53	53	113	173	233	293	354	414	474	535	596	657	718	780	841	53
54	54	114	174	234	294	355	415	475	536	597	658	719	781	842	54
55	55	115	175	235	295	356	416	477	537	598	659	720	782	843	55
56	56	116	176	236	296	357	417	478	538	599	660	721	783	844	56
57	57	117	177	237	297	358	418	479	539	600	661	722	784	845	57
58	58	118	178	238	298	359	419	480	540	601	662	723	785	846	58
59	59	119	179	239	299	360	420	481	541	602	663	724	786	847	59

A Table of Meridional Parts.

M	14d	15d	16d.	17d.	18d.	19d.	20d.	21d.	22d.	23d.	24d.	25d.	26d.	27d.	M
0	848	910	973	1035	1098	1161	1225	1289	1354	1419	1484	1550	1616	1684	0
1	849	911	974	1036	1099	1163	1226	1290	1355	1420	1485	1551	1618	1685	1
2	851	913	975	1037	1100	1164	1227	1291	1356	1421	1486	1552	1619	1686	2
3	852	914	976	1038	1101	1165	1228	1292	1357	1422	1487	1553	1620	1687	3
4	853	915	977	1039	1102	1166	1229	1293	1358	1423	1488	1554	1621	1688	4
5	854	916	978	1041	1103	1167	1230	1295	1359	1424	1490	1556	1622	1689	5
6	855	917	979	1042	1105	1168	1232	1296	1360	1425	1491	1557	1623	1690	6
7	856	918	980	1043	1106	1169	1233	1297	1361	1436	1492	1558	1624	1691	7
8	857	919	981	1044	1107	1170	1234	1298	1362	1427	1493	1559	1625	1693	8
9	858	920	982	1045	1108	1171	1235	1299	1363	1428	1494	1560	1626	1694	9
10	859	921	983	1046	1109	1172	1236	1300	1364	1429	1475	1561	1628	1695	10
11	860	922	984	1047	1110	1173	1237	1301	1366	1431	1496	1562	1629	1696	11
12	861	923	986	1048	1111	1175	1238	1302	1367	1432	1497	1563	1630	1697	12
13	862	924	985	1049	1112	1176	1239	1303	1368	1433	1498	1564	1631	1698	13
14	863	925	987	1050	1113	1177	1240	1304	1379	1434	1499	1565	1632	1699	14
15	864	926	988	1051	1114	1178	1241	1305	1370	1435	1500	1567	1633	1700	15
16	865	927	989	1052	1115	1179	1242	1306	1371	1436	1502	1568	1634	1701	16
17	866	928	990	1053	1116	1180	1243	1307	1372	1437	1503	1569	1635	1703	17
18	867	929	991	1054	1117	1181	1244	1308	1373	1438	1504	1570	1637	1704	18
19	868	930	992	1055	1118	1182	1245	1310	1374	1439	1505	1571	1638	1705	19
20	869	931	994	1056	1119	1183	1246	1311	1375	1440	1506	1572	1639	1706	20
21	870	932	995	1057	1120	1184	1248	1312	1376	1441	1507	1573	1640	1707	21
22	871	933	996	1058	1121	1185	1249	1313	1377	1443	1508	1574	1641	1708	22
23	872	934	997	1059	1122	1186	1250	1314	1379	1444	1509	1575	1642	1709	23
24	873	935	998	1060	1123	1187	1251	1315	1380	1445	1510	1577	1643	1710	24
25	874	936	999	1061	1125	1188	1252	1316	1381	1446	1511	1578	1644	1712	25
26	875	937	1000	1063	1126	1189	1253	1317	1382	1447	1513	1579	1645	1713	26
27	876	938	1001	1064	1127	1190	1254	1318	1383	1448	1514	1580	1647	1714	27
28	877	939	1002	1065	1128	1191	1255	1319	1384	1449	1515	1581	1648	1715	28
29	878	941	1003	1066	1129	1192	1256	1320	1385	1450	1516	1582	1649	1716	29
30	879	942	1004	1067	1130	1193	1257	1321	1386	1451	1517	1583	1650	1717	30
31	880	943	1005	1068	1131	1194	1258	1322	1387	1452	1518	1584	1651	1718	31
32	881	944	1006	1069	1132	1195	1259	1324	1388	1453	1519	1585	1652	1720	32
33	883	945	1007	1070	1133	1196	1260	1325	1389	1455	1520	1586	1653	1721	33
34	884	946	1008	1071	1134	1197	1261	1326	1390	1456	1521	1588	1654	1722	34
35	885	947	1009	1072	1135	1199	1262	1327	1392	1457	1522	1589	1656	1723	35
36	886	948	1010	1073	1136	1200	1264	1328	1393	1458	1524	1590	1657	1724	36
37	887	949	1011	1074	1137	1201	1265	1329	1394	1459	1525	1591	1658	1725	37
38	888	950	1012	1075	1138	1202	1266	1330	1395	1460	1526	1592	1659	1726	38
39	889	951	1013	1076	1139	1203	1267	1331	1396	1461	1527	1593	1660	1727	39
40	890	952	1014	1078	1140	1204	1268	1332	1397	1462	1528	1594	1662	1729	40
41	891	953	1015	1079	1141	1205	1269	1333	1398	1463	1529	1595	1663	1730	41
42	892	954	1016	1070	1142	1206	1270	1334	1399	1464	1530	1596	1664	1731	42
42	893	955	1018	1081	1144	1207	1271	1335	1400	1465	1531	1598	1666	1732	43
44	894	956	1019	1082	1145	1208	1272	1336	1401	1467	1532	1599	1667	1733	44
45	895	957	1020	1083	1146	1209	1273	1338	1402	1468	1533	1600	1668	1734	45
46	896	958	1021	1084	1147	1210	1274	1339	1403	1469	1535	1601	1669	1735	46
47	897	959	1022	1085	1148	1211	1275	1340	1405	1470	1536	1602	1660	1736	47
48	898	960	1023	1086	1149	1212	1276	1341	1406	1471	1537	1603	1670	1738	48
49	899	961	1024	1087	1150	1213	1277	1342	1407	1472	1538	1604	1671	1739	49
50	900	962	1025	1088	1151	1214	1278	1343	1408	1473	1539	1605	1672	1740	50
51	901	963	1026	1089	1152	1216	1280	1344	1409	1474	1540	1606	1673	1741	51
52	902	964	1027	1090	1153	1217	1281	1345	1410	1475	1541	1608	1675	1742	52
53	903	965	1028	1091	1154	1218	1282	1346	1411	1476	1542	1609	1676	1743	53
54	904	966	1929	1092	1155	1219	1283	1347	1412	1477	1543	1610	1677	1744	54
55	905	968	1030	1093	1156	1220	1284	1348	1413	1479	1544	1611	1678	1745	55
56	906	969	1021	1094	1157	1221	1285	1349	1414	1480	1546	1612	1679	1747	56
57	907	970	1032	1095	1158	1222	1286	1350	1415	1481	1547	1613	1680	1748	57
58	908	971	1033	1096	1159	1223	1287	1352	1416	1482	1548	1614	1681	1749	58
59	909	972	1034	1097	1160	1224	1288	1353	1418	1483	1549	1615	1682	1750	59

A Table of Meridional Parts.

M	28d.	29d.	30d.	31d.	32d.	33d.	34d.	35d.	36d.	37d.	38d.	39d.	40d.	41d.	M
0	1751	1819	1838	1958	2028	2100	2171	2244	2318	2393	2468	2545	2623	2702	0
1	1752	1821	1890	1959	2030	2101	2173	2245	2319	2394	2470	2546	2624	2703	1
2	1753	1822	1891	1960	2031	2102	2174	2247	2320	2395	2471	2548	2625	2704	2
3	1755	1823	1892	1962	2032	2103	2175	2248	2322	2396	2472	2549	2627	2706	3
4	1756	1824	1893	1963	2033	2104	2176	2249	2323	2398	2473	2550	2628	2707	4
5	1757	1825	894	1964	2034	2105	2178	2250	2324	2399	2475	2551	2629	2708	5
6	1758	1826	1895	1965	2035	2107	2179	2252	2325	2400	2476	2553	2631	2710	6
7	1759	1827	1896	1966	2037	2108	2180	2253	2327	2401	2477	2554	2632	2711	7
8	1760	1829	1898	1967	2038	2109	2181	2254	2328	2403	2478	2555	2633	2712	8
9	1761	1830	1899	1969	2039	2110	2182	2255	2329	2404	2480	2557	2634	2714	9
10	1762	1831	1900	1970	2040	2111	2184	2256	2330	2405	2481	2558	2636	2715	10
11	1764	1832	1901	1971	2041	2113	2185	2258	2332	2406	2482	2559	2637	2716	11
12	1765	1833	1902	1972	2043	2114	2186	2259	2333	2408	2485	2560	2638	2718	12
13	1766	1834	1903	1973	2044	2115	2187	2260	2334	2409	2486	2562	2640	2719	13
14	1767	1835	1905	1974	2045	2116	2188	2261	2335	2410	2484	2563	2641	2720	14
15	1768	1837	1906	1976	2046	2117	2190	2263	2337	2411	2487	2564	2642	2722	15
16	1769	1838	1907	1977	2047	2119	2191	2264	2338	2413	2489	2566	2644	2723	16
17	1770	1839	1908	1978	2048	2120	2192	2265	2339	2414	490	2567	2645	2724	17
18	1772	1840	1909	1979	2050	2121	2193	2266	2340	2415	2491	2568	2646	2726	18
19	1773	1841	1910	1980	2051	2122	2194	2268	2342	2416	2492	2569	2648	2727	19
20	1774	1842	1911	1981	2052	2123	2196	2269	2343	2418	2494	2571	2649	2728	20
21	1775	1843	1913	1983	2053	2125	2197	2270	2344	2419	2495	2572	2650	2729	21
22	1776	1845	1914	1984	2054	2126	2198	2271	2345	2420	2496	2573	2651	2731	22
23	1777	1846	1915	1985	2056	2127	2199	2272	2346	2421	2498	2575	2653	2732	23
24	1778	1847	1916	1986	2057	2128	2200	2274	2348	2423	2499	2576	2654	2733	24
25	1780	1848	1917	1987	2058	2129	2202	2275	2349	2424	2500	2577	2655	2735	25
26	1781	1849	1918	1088	2059	2131	2203	2276	2350	2425	2501	2578	2657	2736	26
27	1782	1850	1920	1990	2060	2132	2204	2277	2351	2427	2503	2580	2658	2737	27
28	1783	1852	1921	1991	061	2133	2205	2279	2353	2428	2504	2581	2659	2739	28
29	1784	1853	1922	1992	2062	2134	2207	2280	2354	2429	2505	2582	2661	2740	29
30	1785	1854	1923	1993	2064	2135	2208	2281	2355	2430	2506	2584	2662	2742	30
31	1786	1855	1924	1994	2065	2137	2209	2282	2356	2432	2508	2585	2663	2743	31
32	1787	1856	1925	1995	2066	2138	2210	2283	2358	2433	2509	2586	2665	2744	32
33	1789	1857	1927	1997	2067	2139	2211	2285	2359	2434	2510	2584	2666	2746	33
34	1790	1858	1928	1998	2069	2140	2213	2286	2360	2435	2512	2589	2667	2747	34
35	1791	1860	1929	1999	2070	2141	2214	2287	2361	2437	2513	2590	2669	2748	35
36	1792	1861	1930	2000	2071	2143	2215	2288	2363	2438	2514	2591	2670	2750	36
37	1793	1862	1931	2001	2072	2144	2216	2290	2364	2439	2515	2593	2671	2751	37
38	1794	1863	1932	2002	2073	2145	2217	2291	2365	2440	2517	2594	2673	2752	38
39	1796	1864	1934	2004	2075	2146	2219	2292	2366	2442	2518	2595	2674	2754	39
40	1797	1865	1935	2005	2076	2147	2220	2293	2368	2443	2519	2597	2675	2755	40
41	1798	1866	1936	2006	2077	2149	2221	2295	2369	2444	2521	2598	2676	2756	41
42	1799	1868	1937	2007	2078	2150	2222	2296	2370	2445	2522	2599	2678	2758	42
43	1800	1869	1938	2008	2079	2151	2224	2297	2371	2447	2523	2601	2679	2759	43
44	1801	1870	1939	2010	2080	2152	2225	2298	2373	2448	2524	2602	2680	2760	44
45	1802	1871	1941	2011	2082	2153	2226	2299	2374	2449	2526	2603	2681	2762	45
46	1803	1872	1942	2012	2083	2155	2227	2301	2375	2451	2527	2604	2682	2763	46
47	1805	1873	1943	2013	2084	2156	2229	2302	2376	2452	2528	2606	2684	2764	47
48	1806	1875	1944	2014	2085	2157	2230	2303	2378	2453	2530	2607	2685	2766	48
49	1807	1876	1945	2015	2086	2158	2231	2304	2379	2454	2531	2608	2687	2767	49
50	1808	1877	1946	2017	2088	2159	2232	2306	2380	2456	2532	2610	2688	2768	50
51	1809	1878	1948	2018	2089	2161	2233	2307	2381	2457	2533	2611	2690	2770	51
52	1810	1879	1949	2019	2090	2162	2235	2308	2383	2458	2535	2612	2691	2771	52
53	1811	1880	1950	2020	2091	2163	2236	2309	2384	2459	2536	2614	2692	2772	53
54	1813	1881	1951	2021	2092	2164	2237	2311	2385	2401	2537	2615	2694	2774	54
55	1814	1883	1952	2022	2094	2165	2238	2312	2386	2462	2538	2616	2695	2775	55
56	1815	1884	1953	2024	2095	2167	2239	2313	2388	2463	2540	2617	2696	2776	56
57	1816	1885	1955	2025	2096	2168	2241	2314	2389	2464	2541	2619	2698	2778	57
58	1817	1886	1956	2026	2097	2169	2242	2316	2390	2465	2542	2620	2699	2779	58
60	1818	1887	1957	2027	2098	2170	2243	2317	2391	2467	2544	2621	2700	2780	59

A Table of Meridional Parts.

M	42d.	43d.	44d.	45d.	46d	47d.	48d.	49d.	50d.	51d.	52d.	53d.	54d.	55d.	M
0	2782	2863	2946	3030	3116	3203	3292	3382	3474	3569	3665	3764	3865	3968	0
1	2783	2864	2947	3031	3117	3204	3293	3384	3476	3570	3667	3765	3866	3970	1
2	2784	2866	2949	3033	3118	3206	3295	3385	3478	3572	3668	3767	3868	3971	2
3	2786	2867	2950	3034	3120	3207	3296	3387	3479	3574	3670	3769	3870	3973	3
4	2787	2869	2951	3036	3121	3209	3298	3388	3481	3575	3672	3770	3871	3975	4
5	2788	2870	2953	3037	3123	3210	3299	3390	3482	3577	3673	3772	3873	3977	5
6	2790	2871	2954	3038	3124	3212	3301	3391	3484	3578	3675	3774	3875	3978	6
7	2791	2873	2956	3040	3126	3213	3302	3393	3485	3580	3677	3775	3877	3980	7
8	2792	2874	2957	3041	3127	3214	3303	3394	3487	3582	3678	3777	3878	3982	8
9	2794	2875	2958	3043	3129	3216	3305	3396	3488	3583	3680	3779	3880	3984	9
10	2795	2877	2960	3044	3130	3217	3306	3397	3490	3585	3681	3780	3882	3985	10
11	2797	2878	2961	3046	3131	3219	3308	3399	3492	3586	3683	3782	3883	3987	11
12	2798	2880	2963	3047	3133	3220	3309	3400	3493	3588	3685	3784	3885	3989	12
13	2799	2881	2964	3018	3134	3222	3311	3402	3495	3590	3686	3785	3887	3991	13
14	2801	2882	2965	3050	3136	3223	3312	3403	3496	3591	3688	3787	3889	3992	14
15	2802	2884	2967	3051	3137	3225	3314	3405	3498	3593	3690	3789	3890	3994	15
16	2803	2885	2968	3053	3139	3226	3316	3407	3499	3594	3691	3790	3892	3996	16
17	2805	2886	2970	3054	3140	3228	3317	3408	3501	3596	3693	3792	3894	3998	17
18	2806	2888	2971	3055	3142	3229	3319	3410	3503	3598	3695	3794	3895	3999	18
19	2807	2889	2972	3057	3143	3231	3320	3411	3504	3599	3696	3795	3897	4001	19
20	2809	2891	2974	3059	3144	3232	3322	3413	3506	3601	3698	3797	3899	4003	20
21	2810	2892	2975	3060	3146	3234	3323	3414	3507	3602	3699	3799	3901	4005	21
22	2811	2893	2976	3061	3147	3235	3325	3416	3509	3604	3701	3800	3903	4006	22
23	2813	2899	2978	3063	3149	3237	3326	3417	3510	3606	3703	3802	3904	4008	23
24	2814	2896	2979	3064	3150	3238	3328	3419	3512	3607	3704	3804	3906	4010	24
25	2815	2897	2981	3065	3152	3240	3329	3420	3514	3609	3706	3806	3907	4012	25
26	2817	2899	2982	3067	3153	3241	3331	3422	3515	3610	3708	3807	3909	4014	26
27	2818	2900	2983	3068	3155	3242	3332	3423	3517	3612	3709	3809	3911	4015	27
28	2820	2901	2985	3070	3156	3244	3334	3425	3518	3614	3711	3811	3913	4017	28
29	2821	2903	2986	3071	3157	3245	3335	3427	3520	3615	3713	3812	3914	4019	29
30	2822	2904	2984	3073	3159	3247	3337	3428	3521	3617	3714	3814	3916	4021	3
31	2824	2906	2989	3074	3160	3248	3338	3430	3523	3618	3716	3816	3918	4022	31
32	2825	2907	2991	3075	3162	3250	3340	3431	3525	3620	3717	3817	3919	4024	32
33	2826	2908	2992	3077	3163	3251	3341	3433	3526	3622	2719	3819	3921	4026	33
34	2828	2910	2993	3078	3165	3253	3343	3434	3528	3623	3721	3821	3923	4028	34
35	2829	2911	2995	3080	3166	3254	3344	3436	3529	3625	3722	3822	3925	4029	35
36	2830	2913	2996	3081	3168	3256	3346	3437	3531	3626	3724	3824	3926	4031	36
37	2832	2914	2998	3083	3169	3257	3347	3439	3533	3628	3726	3826	3928	4033	37
38	2833	2915	2999	3084	3171	3259	3349	3440	3534	3630	3727	3827	3930	4035	38
39	2834	2917	3000	3085	3172	3260	3350	3442	3536	3631	3729	3829	3932	4037	39
40	2836	2918	3002	3087	3173	3262	3352	3443	3537	3633	3731	3831	3933	4038	40
41	2837	2919	3003	3088	3175	3263	3353	3445	3539	3634	3732	3832	3935	4040	41
42	2839	2921	3005	3090	3176	3265	3355	3447	3540	3636	3734	3834	3937	4042	42
43	2840	2922	3006	3091	3178	3266	3356	3448	3542	3638	3736	3836	3938	4044	43
44	2841	2924	3007	3093	3179	3268	3358	3450	3543	3639	3737	3838	3940	4045	44
45	2843	2925	3009	3094	3181	3269	3359	3451	3545	3641	3739	3839	3942	4047	45
46	2844	2926	3010	3095	3182	3271	3361	3453	3547	3643	3741	3841	3944	4049	46
47	2845	2928	3012	3097	3184	3272	3362	3454	3548	3644	3742	3843	3945	4051	47
48	2847	2929	3013	3098	3185	3274	3364	3456	3550	3646	3744	3844	3947	4052	48
49	2848	2931	3014	3100	3187	3275	3365	3457	3551	3647	3746	3846	3949	4054	49
50	2849	2932	3016	3101	3188	3277	3367	3459	3553	3649	3747	3848	3951	4056	50
51	2851	2933	3017	3103	3190	3278	3368	3460	3555	3651	3749	3849	3952	4058	51
52	2852	2935	3019	3104	3191	3280	3370	3462	3556	3652	3750	3851	3954	4060	52
53	2854	2936	3020	3106	3192	3281	3371	3464	3558	3654	3752	3853	3956	4061	53
54	2855	2937	3021	3107	3194	3283	3373	3465	3559	3656	3754	3855	3958	4063	54
55	2856	2939	3023	3108	3195	3284	3374	3467	3561	3657	3755	3856	3959	4065	55
56	2858	2940	3024	3110	3197	3286	3376	3468	3562	3659	3757	3858	3961	4067	56
57	2859	2942	3026	3111	3198	3287	3378	3470	3564	3660	3759	3860	3963	4069	57
58	2860	2943	3027	3113	3200	3289	3379	3471	3566	3662	3760	3861	3964	4070	58
59	2862	2944	3028	3114	3201	3290	3381	3473	3568	3664	3762	3863	3966	4072	59

A Table of Meridional Parts.

M	56d.	57d.	58d.	59d.	60d.	61d.	62d.	63d.	64d.	65d.	66d.	67d.	68d.	69d.	M
0	4074	4183	4294	4409	4527	4649	4775	4905	5039	5179	5324	5474	5631	5795	0
1	4076	4184	4296	4411	4529	4651	4777	4907	5042	5181	5326	5477	5633	5797	1
2	4077	4186	4298	4413	4531	4653	4779	4909	5044	5184	5328	5479	5636	5800	2
3	4079	4188	4300	4415	4533	4655	4781	4912	5046	5186	5331	5482	5639	5803	3
4	4081	4190	4302	4417	4535	4667	4784	4914	5049	5188	5333	5484	5641	5806	4
5	4083	4192	4304	4419	4537	4660	4786	4916	5051	5191	5336	5487	5644	5809	5
6	4085	4194	4306	4421	4539	4662	4788	4918	5055	5193	5338	5489	5647	5811	6
7	4086	4195	4308	4423	4541	4664	4790	4920	5053	5195	5341	5492	5650	5814	7
8	4088	4197	4309	4425	4543	4666	4792	4923	5058	5198	5343	5495	5652	5817	8
9	4090	4199	4311	4427	4545	4668	4794	4925	5060	5200	5346	5497	5655	5820	9
10	4092	4201	4313	4429	4547	4670	4796	4927	5062	5203	5348	5500	5658	5826	10
11	4094	4203	4315	4431	4549	4672	4798	4929	5065	5205	5351	5502	5660	5825	11
12	4095	4205	4317	4433	4551	4674	4801	4931	5067	5207	5353	5505	5663	5828	12
13	4097	4207	4319	4434	4553	4676	4803	4934	5069	5210	5356	5507	5666	5831	13
14	4099	4208	4321	4436	4555	4678	4805	4936	5071	5212	5358	5510	5668	5834	14
15	4101	4210	4323	4438	4557	4680	4807	4938	5074	5214	5361	5513	5671	5837	15
16	4103	4212	4325	4440	4559	4682	4809	4940	5076	5217	5363	5515	5674	5839	16
17	4104	4214	4327	4442	4561	4684	4811	4943	5078	5219	5366	5518	5676	5842	17
18	4106	4216	4328	4444	4564	4687	4814	4945	5081	5222	5368	5520	5679	5845	18
19	4108	4218	4330	4446	4566	4689	4816	4947	5083	5224	5371	5523	5682	5848	19
20	4110	4220	4332	4448	4568	4691	4818	4949	5085	5226	5373	5526	5685	5851	20
21	4112	4221	4334	4452	4570	4693	4820	4951	5088	1229	5376	5528	5687	5854	21
22	4113	4223	4336	4454	4572	4695	4822	4954	5090	5231	5378	5531	5690	5856	22
23	4115	4225	4338	4456	4574	4697	4824	4956	5092	5234	5380	5533	5693	5859	23
24	4117	4227	4340	4458	4576	4699	4826	4958	5095	5236	5383	5536	5695	5862	24
25	4119	4229	4342	4469	4578	4701	4829	4960	5097	5238	5385	5539	5698	5865	25
26	4121	4231	4344	4460	4580	4703	4831	4963	5099	5241	5388	5541	5701	5868	26
27	4122	4232	4346	4462	4582	4705	4833	4965	5102	5243	5390	5544	5704	5871	27
28	4124	4234	4347	4464	4584	4707	4835	4967	5104	5246	5393	5546	5706	5874	28
29	4126	4236	4349	4466	4586	4710	4837	4969	5106	5248	5395	5549	5709	5876	29
30	4128	4238	4351	4468	4588	4712	4839	4972	5108	5250	5398	5552	5712	5879	30
31	4130	4240	4353	4470	4590	4714	4842	4973	5111	5253	5401	5554	5715	5882	31
32	4132	4242	4355	4472	4592	4716	4844	4976	5113	5255	5403	5557	5717	5885	32
33	4133	4244	4357	4474	4594	4718	4846	4978	5115	5258	5406	5559	5720	5888	33
34	4135	4246	4359	4476	4596	4720	4848	4981	5118	5260	5408	5562	5723	5891	34
35	4137	4247	4361	4478	4598	4722	4850	4983	5120	5263	5411	5565	5725	5894	35
36	4139	4249	4363	4480	4600	4724	4852	4985	5122	5265	5413	5567	5728	5896	36
37	4141	4251	4365	4482	4602	4726	4855	4987	5125	5267	5416	5570	5731	5899	37
38	4142	4253	4367	4484	4604	4728	4857	4990	5127	5270	5418	5573	5734	5902	38
39	4144	4255	4369	4486	4606	4731	4859	4992	5130	5272	5421	5575	5736	5905	39
40	4146	4257	4370	4488	4608	4733	4861	4994	5132	5275	5423	5578	5739	5908	40
41	4148	4259	4372	4490	4610	4735	4863	4996	5134	5277	5426	5580	5742	5911	41
42	4150	4260	4374	4492	4612	4737	4865	4999	5136	5280	5428	5583	5745	5914	42
43	4152	4262	4376	4494	4614	4739	4868	5001	5139	5282	5431	5586	5747	5917	43
44	4153	4264	4378	4495	4616	4741	4870	5003	5141	5284	5433	5588	5750	5919	44
45	4155	4266	4380	4497	4618	4743	4872	5005	5143	5287	5436	5591	5753	5922	45
46	4157	4268	4382	4499	4620	4745	4874	5008	5146	5289	5438	5594	5756	5925	46
47	4159	4270	4384	4501	4623	4747	4876	5010	5148	5292	5441	5596	5758	5928	47
48	4161	4272	4386	4503	4625	4750	4879	5012	5151	5294	5443	5599	5761	5931	48
49	4162	4274	4388	4505	4627	4752	4881	5014	5153	5297	5446	5602	5764	5934	49
50	4164	4275	4390	4507	4629	4754	4883	5017	5155	5299	5448	5604	5767	5937	50
51	4166	4277	4392	4509	4631	4756	4885	5019	5158	5301	5451	5607	5770	5940	51
52	4168	4279	4394	4511	4633	4758	4887	5021	5160	5304	5454	5610	5772	5943	52
53	4170	4281	4396	4513	4635	4760	4890	5023	5162	5306	5456	5612	5775	5946	53
54	4172	4283	4398	4515	4637	4762	4892	5026	5165	5309	5459	5615	5778	5948	54
55	4173	4285	4399	4517	4639	4764	4894	5028	5167	5311	5461	5617	5781	5951	55
56	4175	4287	4401	4519	4641	4766	4896	5030	5169	5314	5464	5620	5783	5954	56
57	4177	4289	4403	4521	4643	4769	4898	5033	5172	5316	5466	5623	5786	5957	57
58	4179	4291	4405	4523	4645	4771	4901	5035	5174	5319	5469	5625	5789	5960	58
59	4181	4292	4407	4525	4647	4773	4903	5037	5176	5321	5471	5628	5792	5963	59

A Table of Meridional Parts.

M	70d.	71d.	72d.	73d.	74d.	75d.	76d.	77d.	78d.	79d.	80d.	81d.	82d.	83d.	M
0	5966	6146	6335	6534	6746	6970	7210	7467	7745	8046	8375	8739	9145	9606	0
1	5969	6149	6338	6538	6749	6974	7214	7472	7749	8051	8381	8745	9153	9614	1
2	5972	6152	6341	6541	6753	6978	7218	7476	7754	8056	8387	8752	9160	9622	2
3	5975	6155	6345	6545	6757	6982	7222	7481	7759	8061	8393	8758	9167	9631	3
4	5978	6158	6348	6548	6760	6986	7227	7485	7764	8067	8398	8765	9174	9639	4
5	5981	6161	6351	6552	6764	6990	7231	7490	7769	8072	8404	8771	9182	9647	5
6	5984	6164	6354	6555	6768	6994	7235	7494	7774	8077	8410	8778	9189	9655	6
7	5986	6167	6358	6558	6771	6997	7239	7498	7778	8083	8416	8784	9196	9664	7
8	5989	6170	6361	6562	6775	7001	7243	7503	7783	8088	8422	8791	9203	9672	8
9	5992	6173	6364	6565	6779	7005	7247	7507	7788	8093	8427	8797	9211	9680	9
10	5995	6177	6367	6569	6782	7009	7252	7512	7793	8099	8433	8804	9218	9689	10
11	5998	6180	6371	6572	6786	7013	7256	7516	7798	8104	8439	8810	9225	9697	11
12	6001	6183	6374	6576	6790	7017	7260	7521	7803	8109	8445	8817	9233	9706	12
13	6004	6186	6377	6579	6793	7021	7264	7525	7808	8115	8451	8823	9240	9714	13
14	6007	6189	6380	6583	6797	7025	7268	7530	7813	8120	8457	8830	9248	9723	14
15	6010	6192	6384	6586	6801	7029	7273	7535	7817	8125	8463	8836	9255	9731	15
16	6013	6195	6387	6590	6804	7033	7277	7539	7822	8131	8469	8843	9262	9740	16
17	6016	6198	6390	6593	6808	7037	7281	7544	7827	8136	8454	8849	9270	9748	17
18	6019	6201	6394	6596	6812	7041	7285	7548	7832	8141	8480	8856	9277	9757	18
19	6022	6205	6397	6600	6815	7045	7289	7553	7837	8147	8486	8863	9285	9765	19
20	6025	6208	6400	6603	6819	7049	7294	7557	7842	8152	8492	8869	9292	9774	20
21	6028	6211	6403	6607	6823	7052	7298	7562	7847	8158	8498	8876	9300	9783	21
22	6031	6214	6407	6610	6826	7056	7302	7566	7892	8163	8504	8882	9307	9791	22
23	6034	6217	6410	6614	6830	7060	7306	7571	7857	8168	8510	8889	9315	9800	23
24	6037	6220	6413	6617	6834	7064	7311	7576	7862	8174	8516	8896	9322	9809	24
25	6040	6223	6417	6621	6838	7068	7315	7580	7867	8179	8522	8903	9330	9817	25
26	6043	6226	6420	6624	841	7072	7319	7585	7872	8185	8528	8909	9337	9826	26
27	6046	6230	6423	6628	6845	7076	7323	7589	7877	8190	8534	8916	9345	9835	27
28	6049	6233	6427	6631	6849	7080	7328	7594	7882	8196	8540	8923	9353	9844	28
29	6052	6236	6430	6635	6853	7084	7332	7598	7887	8201	8546	8930	9360	9812	29
30	6055	6239	6433	6639	6856	7088	7336	7603	7892	8207	8552	8936	9368	9861	30
31	6058	6242	6437	6642	6860	7092	7341	7608	7897	8212	8558	8943	9376	9870	31
32	6061	6245	6440	6646	6864	7096	7345	7612	7902	8218	8565	8950	9383	9879	32
33	6064	6249	6443	6649	6868	7100	7349	7617	7907	8223	8571	8957	9391	9888	33
34	6067	6252	6447	6653	6871	7104	7353	7622	7912	8229	8577	8963	9399	9897	34
35	6070	6255	6450	6656	6875	7108	7358	7626	7917	8234	8583	8970	9407	9906	35
36	6073	6258	6453	6660	6879	7112	7362	7631	7922	8240	8589	8977	9414	9915	36
37	6076	6261	6457	6663	6883	7116	7366	7636	7927	8241	8595	8984	9422	9924	37
38	6079	6264	6460	6667	6886	7120	7371	7640	7932	8251	8601	8991	9430	9933	38
39	6082	6268	6463	6670	6890	7124	7375	7645	7937	8256	8607	8998	9438	9942	39
40	6085	6271	6467	6674	6894	7128	7379	7650	7942	8262	8614	9005	9445	9951	40
41	6088	6274	6470	6677	6898	7132	7384	7654	7948	8267	8620	9012	9453	9959	41
42	6091	6277	6473	6681	6901	7136	7388	7659	7953	8273	8626	9018	9461	9969	42
43	6094	6280	6477	6685	5905	7140	7392	7664	7958	8279	8632	9025	9469	9978	43
44	6097	6283	6480	6688	6909	7145	7397	7668	7963	8284	8638	9032	9477	9987	44
45	6100	6287	6483	6692	6913	7149	7401	7673	7968	8290	8644	9039	9485	9996	45
46	6103	6290	6487	6695	6917	7153	7406	7678	7973	8295	8651	9046	9493	10005	46
47	6106	6293	6490	6699	6920	7157	7410	7683	7978	8301	8657	9053	9501	10015	47
48	6109	6296	6493	6702	6924	7161	7414	7687	7983	8307	8663	9060	9509	10024	48
49	6112	6299	6497	6706	6928	7165	7419	7692	7989	8312	8669	9067	9517	10033	49
50	6115	6303	6500	6710	6932	7169	7423	7697	7994	8318	8676	9074	9525	10043	50
51	6118	6306	6504	6713	6936	7173	7427	7702	7999	8324	8682	9081	9533	10052	51
52	6121	6309	6507	6717	6940	7177	7432	7706	8004	8329	8688	9088	9541	10061	52
53	6124	6312	6511	6720	6943	7181	7436	7711	8009	8335	8695	9096	9549	10071	53
54	6127	6315	6514	6724	6947	7185	7441	7716	8014	8341	8701	9103	9557	10080	54
55	6130	6319	6517	6728	6951	7189	7445	7721	8020	8347	8707	9110	9565	10089	55
56	6133	6322	6521	6731	6955	7194	7449	7725	8025	8352	8714	9117	9573	10099	56
57	6136	6325	6524	6735	6959	7198	7454	7730	8030	8358	8720	9124	9581	10108	57
58	6140	6328	6528	6738	6963	7202	7458	7735	8035	8364	8726	9131	9589	10118	58
59	6142	6332	6531	6742	6966	7206	7463	7740	8040	8369	8733	9138	9598	10127	59

TABLE VIII.
A Table of the Depreſſion or Dip of the Horizon of the ſea.

Elevation of the Eye above the Sea in Feet.	Depreſſion of the Horizon of the Sea.
	′ ″
1	0. 57
2	1. 21
3	1. 39
4	1. 55
5	2. 8
6	2. 20
7	2. 31
8	2. 42
9	2. 52
10	3. 1
12	3. 18
14	3. 34
16	3. 49
18	4. 3
20	4. 16
22	4. 28
24	4. 40
26	4. 52
28	5. 3
30	5. 14
35	5. 39
40	6. 2
45	6. 24
50	6. 44
60	7. 23
70	7. 59
80	8. 32
90	9. 3
100	9. 33

A TABLE IX. A Table of the Refraction of the Heavenly Bodies in Altitude.

App. Alt.	Refr	App. Alt.	Refr	App. Alt.	Refr	App. Alt.	Refr.	App. Alt.	Refr
° ′	′ ″	° ′	′ ″	° ″	′ ″	° ′	′ ″	° ′	′ ″
0. 0	33. 0	4.50	10.11	10.30	5. 0	26. 0	1. 56	59.0	0. 34
0. 5	32.10	5. 0	9.54	10.45	4.53	27.	1. 51	60.	33
0.10	31.22	5.10	9.38	11. 0	4.47	28.	1. 47	61.	32
0.15	30.35	5.20	9.23	11.15	4.40	29.	1. 42	62.	30
0.20	29.50	5.30	9. 8	11.30	4.34	30.	1. 38	63.	29
0.30	28.22	5.40	8.54	11.45	4.29	31.	1. 35	64.	28
0.32	28. 5	5.50	8.41	12. 0	4.23	32.	1. 31	65.	26
0.36	27.30	6. 0	8.28	12.20	4.16	33.	1. 28	66.	25
0.40	27. 0	6.10	8.15	12.40	4. 9	34.	1. 24	67.	24
0.50	25.42	6.20	8. 3	13. 0	4. 3	35.	1. 21	68.	23
1. 0	24.29	6.30	7.51	13.20	3.57	36.	1. 18	69.	22
1.10	23.20	6.40	7.44	13.40	3.51	37.	1. 16	70.	21
1.20	22.15	6.50	7.30	14. 0	3.45	38.	1. 13	71.	19
1.30	21.15	7. 0	7.20	14.20	3.40	39.	1. 10	72.	18
1.40	20.18	7.10	7.11	14.40	3.35	40.	1. 8	73.	17
1.50	19.25	7.20	7. 2	15. 0	3.30	41.	1. 5	74.	16
2. 0	18.35	7.30	6.53	15.30	3.24	42.	1. 3	75.	15
2.10	17.48	7.40	6.45	16. 0	3.17	43.	1. 1	76.	14
2.20	17. 4	7.50	6.37	16.30	3.10	44.	59	77.	13
2.30	16.24	8. 0	6.29	17. 0	3. 4	45.	57	78.	12
2.40	15.45	8.10	6.22	17.30	2.59	46.	55	79.	11
2.50	15. 9	8.20	6.15	18. 0	2.54	47.	53	80.	10
3. 0	14.36	8.30	6. 8	18.30	2.49	48.	51	81.	9
3.10	14. 4	8.40	6. 1	19. 0	2.44	49.	49	82.	8
3.20	13.34	8.50	5.55	19.30	2.39	50.	48	83.	7
3.30	13. 6	9. 0	5.48	20. 0	2.35	51.	46	84.	6
3.40	12.40	9.10	5.42	20.30	2.31	52.	44	85.	5
3.50	12.15	9.20	5.36	21. 0	2.27	53.	43	86.	4
4. 0	11.51	9.30	5.31	21.30	2.24	54.	41	87.	3
4.10	11.29	9.40	5.25	22. 0	2.20	55.	40	88.	2
4.20	11. 8	9.50	5.20	23. 0	2.14	56.	38	89.	1
4.30	10.48	10. 0	5.15	24. 0	2. 7	57.	37	90.	0
4.40	10.29	10.15	5. 7	25. 0	2. 2	58.	35		

T A B L E X.

A TABLE of the SUN'S DECLINATION for the Years 1785, 1789, 1793, 1797.

Firſt after LEAP-YEAR.

Days.	Jan.	Feb.	Marc.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
	South	South	South	North	North	North	North	North	North	South	South	South
	D. M.	D. M.	D. M	D. M.	D. M.	D. M.	D. M.	D. M.	D. M	D. M.	D. M.	D.M.
1	22 58	16 54	7 19	4 48	15 16	22 9	23 6	17 54	8 3	3 26	14 40	21 56
2	22 53	16 37	6 56	5 11	15 34	22 17	23 2	17 39	7 43	3 49	14 59	22 5
3	22 46	16 19	6 33	5 34	15 52	22 24	22 57	17 23	7 21	4 12	15 17	22 14
4	22 40	16 1	6 10	5 57	16 9	22 31	22 52	17 7	6 59	4 35	15 36	22 22
5	22 33	15 43	5 47	6 19	16 26	22 38	22 46	16 51	6 37	4 58	15 54	22 29
6	22 26	15 24	5 24	6 42	16 43	22 44	22 40	16 34	6 14	5 22	16 12	22 36
7	22 18	15 6	5 0	7 5	17 0	22 50	22 33	16 18	5 52	5 45	16 30	22 43
8	22 10	14 47	4 37	7 27	17 16	22 55	22 27	16 1	5 29	6 8	16 47	22 49
9	22 01	14 27	4 14	7 49	17 32	23 0	22 19	15 43	5 6	6 30	17 4	22 55
10	21 52	14 8	3 50	8 11	17 47	23 5	22 12	15 26	4 44	6 53	17 21	23 0
11	21 42	13 47	3 27	8 33	18 3	23 9	22 4	15 8	4 21	7 16	17 38	23 5
12	21 33	13 27	3 3	8 55	18 18	23 13	21 56	14 50	3 58	7 38	17 54	23 10
13	21 22	13 7	2 39	9 17	18 33	23 16	21 47	14 31	3 35	8 1	18 10	23 14
14	21 11	12 47	2 16	9 38	18 47	23 19	21 38	14 13	3 12	8 23	18 26	23 17
15	21 0	12 26	1 52	10 0	19 1	23 22	21 28	13 54	2 48	8 46	18 41	23 20
16	20 49	12 5	1 28	10 21	19 15	23 24	21 18	13 35	2 25	9 8	18 56	23 23
17	20 37	11 44	1 5	10 42	19 29	23 25	21 8	13 16	2 2	9 30	19 11	23 25
18	20 25	11 23	0 41	11 3	19 42	23 27	20 58	12 56	1 39	9 52	19 25	23 26
19	20 12	11 2	0 17	11 24	19 55	23 28	20 47	12 37	1 15	10 13	19 39	23 27
20	19 59	10 40	N. 6	11 44	20 7	23 28	20 35	12 17	0 52	10 35	19 52	23 28
21	19 45	10 18	0 30	12 5	20 19	23 28	20 24	11 57	0 29	10 56	20 6	23 28
22	19 31	9 56	0 54	12 25	20 31	23 28	20 12	11 37	0 5	11 18	20 18	23 28
23	19 17	9 34	1 17	12 45	20 42	23 27	20 0	11 16	S. 18	11 39	20 31	23 27
24	19 3	9 12	1 41	13 4	20 54	23 26	19 47	10 56	0 42	12 0	20 43	23 26
25	18 48	8 50	2 5	13 24	21 4	23 24	19 34	10 35	1 5	12 20	20 55	23 24
26	18 33	8 27	2 28	13 43	21 15	23 22	19 21	10 14	1 29	12 41	21 6	23 22
27	18 17	8 5	2 52	14 2	21 25	23 20	19 7	9 53	1 52	13 1	21 17	23 19
28	18 1	7 42	3 15	14 21	21 34	23 17	18 53	9 32	2 15	13 21	21 27	23 16
29	17 45		3 38	14 40	21 44	23 14	18 39	9 10	2 39	13 41	21 37	23 13
30	17 28		4 2	14 58	21 53	23 10	18 24	8 49	3 2	14 1	21 47	23 9
31	17 12		4 25		22 1		18 10	8 27		14 20		23 4

A TABLE of the SUN'S DECLINATION for the Years 1785, 1789, 1793, 1797.

Each being the Second after LEAP-YEAR.

Days.	Jan.	Feb.	Marc.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
	South	South	South	North	North	North	North	North	North	South	South	South
	D. M.	D. M.	D. M	D. M.	D. M.	D. M.	D. M.	D. M.	D. M.	D. M.	D. M.	D. M.
1	22 59	16 58	7 25	4 42	15 12	22 7	23 7	17 58	8 10	3 20	14 35	21 54
2	22 54	16 41	7 2	5 5	15 30	22 15	23 3	17 43	7 49	3 43	14 54	22 3
3	22 48	16 23	6 39	5 28	15 47	22 23	22 58	17 27	7 26	4 7	15 13	22 12
4	22 42	16 5	6 16	5 51	16 5	22 30	22 53	17 11	7 4	4 30	15 32	22 20
5	22 35	15 47	5 53	6 14	16 22	22 36	22 47	16 55	6 42	4 53	15 50	22 27
6	22 27	15 29	5 29	6 37	16 39	22 43	22 41	16 38	6 20	5 16	16 8	22 35
7	22 20	15 10	5 6	6 59	16 56	22 48	22 35	16 23	5 57	5 39	16 26	22 41
8	22 12	14 51	4 43	7 21	17 12	22 54	22 28	16 5	5 34	6 2	16 43	22 48
9	22 3	14 32	4 19	7 44	17 28	22 59	22 21	15 47	5 12	6 25	17 0	22 54
10	21 54	14 12	3 56	8 6	17 44	23 4	22 14	15 30	4 49	6 48	17 17	22 59
11	21 45	13 52	3 32	8 28	17 59	23 8	22 6	15 12	4 26	7 11	17 34	23 4
12	21 35	13 32	3 9	8 50	18 14	23 12	21 58	14 54	4 3	7 33	17 50	23 8
13	21 25	13 12	2 45	9 12	18 29	23 15	21 49	14 36	3 40	7 56	18 6	23 12
14	21 14	12 52	2 21	9 33	18 44	23 18	21 40	14 17	3 17	8 18	18 22	23 16
15	21 3	12 31	1 58	9 55	18 58	23 21	21 31	13 58	2 54	8 40	18 37	23 20
16	20 52	12 10	1 35	10 16	19 12	23 23	21 21	13 40	2 31	9 3	18 52	23 22
17	20 40	11 49	1 10	10 37	19 25	23 25	21 11	13 20	2 7	9 24	19 7	23 24
18	20 28	11 28	0 47	10 58	19 39	23 26	21 0	13 1	1 44	9 47	19 22	23 26
19	20 15	11 7	0 23	11 19	19 52	23 27	20 49	12 41	1 21	10 8	19 36	23 27
20	20 2	10 45	N. 1	11 39	20 4	23 28	20 38	12 22	0 57	10 30	19 49	23 28
21	19 48	10 23	0 24	12 0	20 16	23 28	20 27	12 2	0 34	10 51	20 2	23 28
22	19 35	10 2	0 48	12 20	20 28	23 28	20 15	11 41	0 11	11 13	20 15	23 28
23	19 21	9 40	1 12	12 40	20 40	23 27	20 3	11 21	S. 13	11 34	20 28	23 27
24	19 6	9 17	1 35	13 0	20 51	23 26	19 50	11 1	0 36	11 55	20 40	23 26
25	18 51	8 55	1 59	13 19	21 2	23 25	19 37	10 40	1 0	12 15	20 52	23 25
26	18 36	8 33	2 22	13 39	21 12	23 23	19 24	10 19	1 23	12 35	21 3	23 23
27	18 21	8 10	2 46	13 58	21 22	23 21	19 10	9 58	1 46	12 55	21 14	23 20
28	18 5	7 48	3 9	14 17	21 32	23 18	18 57	9 37	2 10	13 17	21 25	23 17
29	17 49		3 33	14 35	21 41	23 15	18 42	9 15	2 33	13 36	21 35	23 14
30	17 32		3 56	14 54	21 50	23 11	18 28	8 54	2 57	13 56	21 45	23 10
31	17 15		4 19		21 59		18 13	8 32		14 16		23 5

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A TABLE of the SUN'S DECLINATION for the YEARS 1783, 1787, 1791, 1795, 1799.

Third after Leap-Year.

Days	Jan.	Feb.	Marc.	April	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
	South	South	South	North	North	North	North	North	North	South	South	South
	D. M.	D. M.	D. M.	D. M.	D. M.	D. M.	D. M.	D. M.	D M.	D. M.	D. M.	D. M.
1	23 0	17 2	7 30	4 36	15 8	22 5	23 8	18 2	8 16	3 14	14 30	21 52
2	22 55	16 45	7 7	5 0	15 26	22 13	23 4	17 46	7 54	3 38	14 50	22 1
3	22 49	16 28	6 44	5 23	15 43	22 21	22 59	17 31	7 32	4 1	15 8	22 10
4	22 43	16 10	6 21	5 46	16 1	22 28	22 54	17 15	7 10	4 24	15 27	22 18
5	22 36	15 51	5 58	6 8	16 18	22 35	22 49	16 59	6 47	4 48	15 45	22 26
6	22 29	15 33	5 35	6 31	16 35	22 41	22 43	16 42	6 25	5 11	16 4	22 33
7	22 22	15 14	5 12	6 54	16 52	22 47	22 37	16 26	6 2	5 34	16 21	22 40
8	22 14	15 55	4 48	7 16	17 8	22 53	22 30	16 9	5 40	5 57	16 39	22 46
9	22 5	14 36	4 25	7 39	17 24	22 58	22 23	15 51	5 17	6 20	16 56	22 52
10	21 56	14 17	4 1	8 1	17 40	23 3	22 16	15 34	4 54	6 42	17 13	22 58
11	21 48	13 57	3 38	8 23	17 55	23 7	22 8	15 16	4 32	7 5	17 30	23 3
12	21 37	13 37	3 14	8 43	18 11	23 11	21 0	14 58	4 9	7 28	17 46	23 7
13	21 27	13 17	2 51	9 7	18 26	23 15	21 51	14 40	3 46	7 50	18 2	23 12
14	21 17	12 57	2 27	9 28	18 40	23 18	21 42	14 22	3 23	8 13	18 18	23 15
15	21 6	12 36	2 3	9 50	18 54	23 20	21 33	14 3	3 0	8 35	18 34	23 19
16	20 54	12 15	1 40	10 11	19 8	23 23	21 23	13 44	2 36	8 57	18 49	23 21
17	20 43	11 54	1 16	10 32	19 22	23 25	21 13	13 25	2 13	9 19	19 4	23 24
18	20 31	11 33	0 52	10 53	19 35	23 26	21 3	13 6	1 50	9 41	19 18	23 25
19	20 18	11 12	0 29	11 14	19 48	23 27	20 52	12 46	1 27	10 3	19 32	23 27
20	20 5	10 50	0 5	11 34	20 1	23 28	20 41	12 26	1 3	10 25	19 46	23 28
21	19 52	10 29	N. 19	11 55	20 13	23 28	20 20	12 7	0 40	10 46	19 59	23 28
22	19 38	10 7	0 42	12 15	20 24	23 28	20 18	11 46	0 16	11 7	20 12	23 28
23	19 24	9 45	1 6	12 34	20 37	23 27	20 6	11 26	S. 7	11 29	20 25	23 28
24	19 10	9 23	1 30	12 55	20 48	23 27	19 53	11 6	0 31	11 50	20 37	23 27
25	18 55	9 1	1 53	13 15	20 59	23 25	19 40	10 45	0 54	12 10	20 49	23 25
26	18 49	8 38	2 17	13 34	21 10	23 23	19 27	10 24	1 17	12 31	21 1	23 23
27	18 24	8 16	2 40	13 53	21 20	23 21	19 14	10 3	1 41	12 51	21 12	23 21
28	18 9	7 53	3 4	14 12	21 30	23 18	19 0	9 42	2 4	13 12	21 22	23 18
29	17 53		3 27	14 31	21 39	23 15	18 46	9 20	2 28	13 32	21 33	23 14
30	17 36		3 50	14 49	21 48	3 12	18 31	8 59	2 51	13 52	21 43	23 11
31	17 19		4 14		21 57		18 17	8 37		14 11		23 6

A TABLE of the SUN'S DECLINATION for the YEARS 1784, 1788, 1792, 1796, 1800.

Each being Leap-Year.

Days	Jan.	Feb.	Marc.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
	South	South	South	North	North	North	North	North	North	South	South	South
	D. M.	D. M.	D. M.	D. M.	D. M.	D. M.	D. M.	D. M.	D. M.	D. M.	D. M.	D. M.
1	23 2	17 7	7 14	4 53	15 21	22 11	23 5	17 51	8 0	3 31	14 44	21 59
2	22 57	16 50	6 52	5 16	15 38	22 19	23 1	17 35	7 38	3 55	15 3	22 7
3	22 51	16 32	6 28	5 39	15 56	22 26	22 56	17 19	7 16	4 18	15 22	22 16
4	22 45	16 15	6 5	6 2	16 13	22 33	22 50	17 3	6 54	4 41	15 40	22 24
5	22 38	15 57	5 42	6 25	16 30	22 39	22 45	16 47	6 31	5 4	15 59	22 31
6	22 31	15 38	5 18	6 47	16 47	22 45	22 38	16 30	6 9	5 27	16 17	22 38
7	22 24	15 20	4 55	7 10	17 3	22 51	22 32	16 14	5 46	5 50	16 34	22 45
8	22 16	15 1	4 31	7 32	17 20	22 56	22 25	15 56	5 24	6 13	16 52	22 51
9	22 8	14 41	4 8	7 55	17 36	23 1	22 18	15 39	5 1	6 36	17 9	22 56
10	21 59	14 22	3 44	8 17	17 51	23 6	22 10	15 21	4 38	6 59	17 25	23 1
11	21 50	14 2	3 21	8 39	18 6	23 10	22 2	15 3	4 15	7 21	17 42	23 6
12	21 40	13 43	2 57	9 0	18 21	23 14	21 54	14 45	3 52	7 44	17 58	23 11
13	21 30	13 23	2 34	9 22	18 36	23 17	21 45	14 27	3 29	8 6	18 14	23 14
14	21 20	13 2	2 10	9 44	18 51	23 20	21 35	14 8	3 6	8 29	18 29	23 18
15	21 9	12 42	1 46	10 5	19 5	23 22	21 26	13 49	2 43	8 51	18 45	23 21
16	20 58	12 21	1 23	10 26	19 18	23 24	21 16	13 30	2 20	9 13	19 0	23 23
17	20 46	12 0	0 59	10 47	19 32	23 26	21 6	13 11	1 56	9 35	19 14	23 25
18	20 34	11 39	0 35	11 8	19 46	23 27	20 55	12 52	1 33	9 57	19 28	23 27
19	20 21	11 18	0 12	11 25	19 58	23 28	20 44	12 32	1 10	10 19	19 42	23 28
20	20 9	10 56	N. 12	11 49	20 10	23 28	20 33	12 12	0 46	10 40	19 56	23 28
21	19 55	10 35	0 34	12 9	20 22	23 28	20 21	11 52	0 23	11 2	20 9	23 28
22	19 42	10 13	0 59	12 30	20 34	23 28	20 9	11 32	S. 0	11 23	20 21	23 28
23	19 28	9 51	1 23	12 49	20 45	23 27	19 57	11 11	0 24	11 44	20 34	23 27
24	19 14	9 29	1 47	13 9	20 56	23 26	19 44	10 51	0 47	12 5	20 46	23 26
25	18 59	9 7	2 10	13 29	21 7	23 24	19 31	10 30	1 11	12 25	20 57	23 24
26	18 44	8 44	2 34	13 48	21 17	23 23	19 17	10 9	1 34	12 46	21 9	23 22
27	18 29	8 32	2 57	14 7	21 27	23 19	19 4	9 4	1 58	13 6	21 19	23 19
28	18 13	7 59	3 21	14 26	21 37	23 16	18 50	9 27	2 21	13 26	21 30	23 15
29	17 57	7 37	3 4	14 44	21 46	23 13	18 35	9 5	2 45	13 46	21 40	23 12
30	17 41		4 7	15 2	21 55	23 9	18 21	8 44	3 8	14 6	21 49	23 8
31	17 24		4 30		22 3		18 6	8 22		14 26		23 3

TABLE XI. A Table of Amplitudes.

DECLINATION in DEGREES.

Lat.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	23 29	Lat.
	D M	D M	D M	D M	D M	D M	D M	D M	D M	D M	D M	D M	D M	D M	D M	D M	D M	D M	D M	D M	D M	D M	D M	D M	
1	1. 0	2. 0	3. 0	4. 0	5. 0	6. 0	7. 0	8. 0	9. 0	10. 0	11. 0	12. 0	13. 0	14. 0	15. 0	16. 0	17. 0	18. 0	19. 0	20. 0	21. 0	22. 0	23. 0	23.29	1
2	1. 0	2. 0	3. 0	4. 0	5. 0	6. 0	7. 0	8. 0	9. 0	10. 0	11. 0	12. 0	13. 0	14. 0	15. 0	16. 1	17. 1	18. 1	19. 1	20. 1	21. 1	22. 1	23. 1	23.30	2
3	1. 0	2. 0	3. 0	4. 0	5. 0	6. 0	7. 1	8. 1	9. 1	10. 1	11. 1	12. 1	13. 1	14. 1	15. 1	16. 1	17. 1	18. 1	19. 1	20. 2	21. 2	22. 2	23. 2	23.31	3
4	1. 0	2. 0	3. 0	4. 0	5. 0	6. 1	7. 1	8. 1	9. 1	10. 1	11. 2	12. 1	13. 2	14. 2	15. 2	16. 2	17. 2	18. 2	19. 3	20. 3	21. 3	22. 3	23. 3	23.33	4
5	1. 0	2. 0	3. 0	4. 1	5. 1	6. 1	7. 2	8. 2	9. 2	10. 2	11. 3	12. 3	13. 3	14. 3	15. 4	16. 4	17. 4	18. 4	19. 4	20. 5	21. 5	22. 5	23. 5	23.35	5
6	1. 0	2. 0	3. 1	4. 1	5. 1	6. 2	7. 2	8. 2	9. 3	10. 2	11. 3	12. 4	13. 4	14. 4	15. 5	16. 5	17. 5	18. 6	19. 6	20. 7	21. 7	22. 7	23. 8	23.38	6
7	1. 0	2. 1	3. 1	4. 2	5. 2	6. 2	7. 3	8. 3	9. 4	10. 4	11. 5	12. 5	13. 6	14. 6	15. 7	16. 7	17. 8	18. 8	19. 9	20. 9	21.10	22.10	23.11	23.40	7
8	1. 0	2. 1	3. 1	4. 2	5. 3	6. 3	7. 4	8. 4	9. 5	10. 5	11. 6	12. 7	13. 8	14. 8	15. 9	16.10	17.10	18.11	19.11	20.12	21.13	22.13	23.14	23.44	8
9	1. 0	2. 1	3. 2	4. 3	5. 3	6. 4	7. 5	8. 6	9. 7	10. 7	11. 8	12. 9	13.10	14.10	15.11	16.12	17.13	18.14	19.15	20.16	21.17	22.17	23.18	23.49	9
10	1. 1	2. 2	3. 3	4. 4	5. 5	6. 6	7. 7	8. 8	9. 9	10.10	11.11	12.12	13.13	14.14	15.15	16.16	17.17	18.18	19.19	20.20	21.21	22.22	23.23	23.54	10
11	1. 1	2. 2	3. 3	4. 4	5. 5	6. 6	7. 7	8. 9	9.10	10.11	11.13	12.13	13.15	14.16	15.17	16.18	17.20	18.21	19.22	20.24	21.25	22.26	23.28	23.58	11
12	1. 1	2. 3	3. 4	4. 5	5. 7	6. 8	7. 9	8.11	9.12	10.13	11.15	12.16	13.18	14.19	15.2[illegible]	16.2[illegible]	17.23	18.25	19.26	20.28	21.29	22.31	23.33	24. 3	12
13	1. 2	2. 3	3. 5	4. 6	5. 8	6.10	7 11	8.12	9.14	10.15	11.17	12.19	13.21	14.22	15.24	16.26	17.28	18.30	19.31	20.33	21.35	22.37	23.38	24. 8	13
14	1. 2	2. 3	3. 5	4. 7	5. 9	6.11	7.13	8.15	9.17	10.18	11.20	12.22	13.24	14.26	15.28	16.30	17.32	18.34	19.36	20.38	21.41	22.43	23.45	24.15	14
15	1. 2	2. 4	3. 6	4. 8	5.11	6.13	7.15	8.17	9.19	10.21	11.23	12.25	13.28	14.30	15.32	16.35	17.37	18.40	19.42	20.44	21.46	22.49	23.51	24.22	15
16	1. 2	2. 5	3. 7	4.10	5.12	6.15	7.17	8.19	9.22	10.24	11.27	12.29	13.32	14.34	15.37	16.40	17.42	18.45	19.48	20.51	21.53	22.56	23.59	24.29	16
17	1. 2	2. 5	3. 8	4.11	5.13	6.16	7.19	8.22	9.25	10.27	11.30	12.33	13.36	14.39	15.42	16.45	17.48	18.51	19.54	20.57	22. 0	23. 4	24. 7	24.38	17
18	1. 3	2. 6	3. 9	4.12	5.15	6.19	7.22	8.25	9.28	10.30	11.34	12.38	13.41	14.44	15.46	16.51	17.54	18.57	20. 1	21. 5	22. 8	23.12	24.15	24.46	18
19	1. 3	2. 7	3.10	4.13	5.17	6.21	7.24	8.28	9.31	10.34	11.38	12.42	13.47	14.50	15.53	16.57	18. 1	19. 5	20. 8	21.12	22.16	23.20	24.24	24.56	19
20	1. 4	2. 8	3.12	4.15	5.19	6.23	7.27	8.31	9.35	10.38	11.43	12.47	13.51	14.55	16. 0	16. 4	18. 8	19.12	20.16	21.20	22.25	23.29	24.34	25. 5	20
21	1. 4	2. 8	3.13	4.17	5.21	6.26	7.30	8.34	9.39	10.43	11.48	12.52	13.57	15. 1	16. 5	17.10	18.15	19.20	20.24	21.29	22.34	23.39	24.44	25.16	21
22	1. 4	2. 9	3.14	4.19	5.23	6.28	7.33	8.38	6.43	10.47	11.53	12.58	14. 3	15. 8	6.13	17.18	18.23	19.28	20.33	21.39	22.44	23.50	24.55	25.27	22
23	1. 5	2.10	3.15	4.21	5.26	6.31	7.36	8.42	9.47	10.52	11.58	13. 3	14. 9	15.14	16.19	17.2[illegible]	18.31	19.37	20.43	21.49	22.55	24. 1	25. 7	25.39	23
24	1. 5	2.11	3.17	4.23	5.28	6.34	7.40	8.45	9.51	10.57	12. 3	13. 9	14.17	15.21	16.27	17.34	18.40	19.46	20.52	21.59	23. 6	24.12	25.19	25.51	24
25	1. 6	2.12	3.18	4.25	5.31	6.37	7.43	8.50	9.56	11. 2	12. 9	13.16	14.23	15.29	16.35	17.42	18.49	19.56	21. 3	22.10	23.18	24.24	25.32	26. 5	25
26	1. 7	2.13	3.20	4.27	5.33	6.41	7.48	8.54	10. 1	11. 8	12.15	13.23	14.30	15.37	16.4[illegible]	17.51	18.59	20. 6	21.14	22.22	23.30	24.38	25.46	26.19	26
27	1. 7	2.14	3.22	4.29	5.36	6.44	7.51	8.59	10. 6	11.14	12.22	13.30	14.38	15.45	16.53	17. 1	19. 9	20.17	21.26	22.34	23.43	24.51	26. 0	26.34	27
28	1. 8	2.16	3.24	4.37	5.40	6.48	7.56	9. 4	10.12	11.20	12.29	13.37	14.46	15.54	17.13	18.11	19.20	20.29	21.38	22.48	24.57	25. 6	26.16	26.49	28
29	1. 8	2.17	3.25	4.34	5.43	6.52	8. 0	9. 9	10.18	11.27	12.36	13.45	14.54	16. 3	17.1[illegible]	18.22	19.31	20.41	21.51	23. 1	24.11	25.22	26.32	27. 6	29
30	1. 9	2.18	3.28	4.37	5.46	6.56	8. 5	9.15	10.24	11.33	12.43	13.52	15. 3	16.13	17.2[illegible]	18.33	19.43	20.54	22. 5	23.16	24.27	25.38	26.49	27.23	30
31	1.10	2.20	3.30	4.40	5.50	7. 0	8.10	9.21	10.31	11.41	12.52	14. 2	15.13	16.23	17.34	18.45	19.56	21. 8	22.19	23.31	24.43	25.55	27. 7	27.42	31
32	1.10	2.21	3.32	4.43	5.54	7. 5	8.16	9.27	10.38	11.49	13. 0	14.11	15.23	16.34	17.46	18.58	20.10	21.22	22.34	23.47	25. 0	26.13	27.26	28. 1	32
33	1.11	2.23	3.35	4.46	5.58	7. 9	8.20	9.33	10.45	11.57	13. 9	14.21	5.33	16.45	17.58	19.11	20.24	21.37	22.50	24. 4	25.18	26.32	27.46	28.23	33

A Table of Amplitudes.

Lat.	DECLINATION in DEGREES.																							Lat.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	23 29	
	D M	D M	D M	D M	D M	D M	D M	D M	D M	D M	D M	D M	D M	D M	D M	D M	D M	D M	D M	D M	D M	D M	D M	D M	
34	1.12	2.25	3.37	4.50	6. 2	7.15	8.27	9.39	10.52	12. 5	13.18	14.31	15.44	16.57	18.11	19.25	20.39	21 53	23. 7	24.21	25.36	26.51	28. 7	28.44	34
35	1.13	2.27	3.40	4.53	6. 6	7.20	8.33	9.47	11. 0	12.14	13.28	14.42	15.55	17.11	18.25	19.40	20.55	22.10	23.25	24.40	25.56	27.13	28.29	29. 7	35
36	1.14	2.28	3.43	4.57	6.11	7.25	8.39	9.54	11. 9	12.23	13.38	14.53	16. 9	17.24	18.39	19.55	21.11	22.27	23.43	25. 0	26.18	27 35	28.53	29.30	36
37	1.15	2.30	3.45	5. 0	6.15	7.31	8.46	10. 2	11.17	12.33	13.49	15. 5	16.21	17.38	18.54	20.11	21.28	22.46	24. 3	25.21	26.39	27.58	29.17	29.56	37
38	1.16	2.32	3.48	5. 5	6.21	7.37	8.54	10.11	11.27	12.44	14. 1	15.18	16.35	17.53	19.10	20.28	21.46	23. 5	24.24	25.43	27. 3	28.23	29.43	30.23	38
39	1.17	2.34	3.51	5. 8	6.26	7.43	9. 1	10.19	11.37	12.54	14.12	15.31	17.49	18. 8	19.27	20.46	22. 6	23.27	24.46	26. 6	27.27	28.49	30.11	30.51	39
40	1.18	2.36	3 55	5.13	6.32	7.50	9. 9	10.28	11.47	13. 6	14.25	15.45	17. 5	18.24	19.44	21. 5	22.26	23.47	25. 9	26.31	27.53	29.16	30.40	31.22	40
41	1.19	2.39	3 58	5.18	6.38	7.57	9.17	10.37	11.57	13.18	14.39	16. 0	17.21	18.42	20. 4	21.26	22 43	24 10	25.33	26.56	28.21	29.46	31.11	31.53	41
42	1.21	2.41	4. 2	5.23	6.44	8. 5	9.26	10.47	12. 9	13.31	14.53	16.15	17.37	19. 0	20.23	21.46	23.10	24.24	25.58	27.24	28.50	30.16	31.43	32.26	42
43	1.22	2.44	4. 6	5.28	6.51	8.13	9.35	10.58	12.21	13.44	15. 7	16.31	17.55	19.19	20.43	22. 8	23 34	24.59	26.25	27.53	29.20	30.48	32.16	33. 0	43
44	1.23	2.47	4.10	5.34	6.58	8.21	9.45	11. 9	12.34	13.58	15.23	16.48	18.13	19.39	21. 5	22.32	23.59	25.26	26.54	28.23	29.53	31.22	32.51	33.37	44
45	1.25	2.50	4.15	5.40	7. 5	8.30	9.56	11.21	12.47	14.13	15.38	17. 6	18.33	20. 0	21.28	22.56	24.25	25.54	27.25	28 56	30.27	31.58	33.30	34.16	45
46	1.26	2.53	4.19	5.46	7.12	8.39	10. 6	11.34	13. 1	14.28	15.56	17.25	18.54	20.23	21.52	23.23	24.53	26.25	27.58	29.31	31. 3	32.37	34.12	35. 0	46
47	1.28	2.56	4.24	5.52	7.20	8.49	10.18	11.47	13.16	14.44	16.15	17.45	19.16	20.47	22.18	23.50	25.23	26.57	28.32	30. 7	31 42	33.18	34.56	35.46	47
48	1.29	2.59	4.29	5.59	7.29	8.59	10.30	12. 0	13.31	15. 2	16.34	18. 6	19.39	21.12	22.45	24.40	25.55	27.31	29. 7	30.45	32.23	34. 3	35.43	36.35	48
49	1.31	3. 3	4.34	6. 6	7.38	9.10	10.42	12.14	13.47	15.21	16.54	18.28	20. 3	21.38	23.14	24.51	26.28	28. 6	29.45	31.25	33. 6	34.48	36.33	37.26	49
50	1.33	3. 6	4.40	6.14	7.48	6.21	10.55	12.29	14. 5	15.40	17.16	18.52	20.29	22. 6	23.45	25.24	27. 5	28 43	30.25	32. 8	33.52	35.37	37.26	38.20	50
51	1.35	3.10	4.46	6.22	7.58	9.33	11. 9	12.46	14.24	16. 1	17.39	19.18	20.57	22.37	24.18	25.59	27.41	29.24	31. 8	32.54	34.41	36.30	38.23	39.19	51
52	1.37	3.15	4.52	6.30	8. 8	9.46	11.24	13. 3	14.43	16 23	18. 6	19.44	21.26	23. 8	24.54	26.36	28.21	30. 7	31.55	33.41	35.34	37.27	39.24	40.23	52
53	1.40	3.20	4.59	6.39	8.19	10. 0	11.40	13.21	15. 3	16.46	18.29	20.12	21.57	23.47	25.28	27.16	29. 4	30.53	32.45	34.38	36 33	38.29	40.29	41 29	53
54	1.42	3.24	5. 5	6.49	8.31	10.15	11.57	13.41	15.26	17.11	18.57	20.43	22.30	24.18	26. 7	27.58	29.50	31.42	33.38	35.35	37.32	39.26	41.40	42.46	54
55	1.45	3.29	5.14	6.59	8.41	10.30	12.15	14. 2	15.49	17.37	19.26	21.14	23. 5	24.56	26.49	28.43	30.39	32.35	34.35	36.36	38 39	40.47	42.56	44. 0	55
56	1.47	3.34	5.22	7.10	8.57	10.47	12.35	14.24	16.14	18. 5	19.56	21.49	23.43	25.37	27.34	29.32	31.31	33.33	35.36	37.42	39 51	42. 4	44.19	45.27	56
57	1.50	3.40	5.31	7.22	9.11	11. 4	12.56	14.48	16.45	18.33	20.29	22.25	24.23	26.21	28.32	30.24	32.27	34.34	36.46	38.53	41. 9	43.27	45.50	47. 2	57
58	1.53	3.46	5.40	7.34	9 26	11.22	13.18	15.14	17.10	19. 7	21. 4	23. 4	25. 0	27. 9	29.14	31.21	33.28	35.40	37.54	40.12	42.34	44.59	47.30	48.46	58
59	1.56	3.53	5.50	7.47	9.43	11.42	13.41	15.41	17.41	19.41	21.42	23.47	25.54	28. 1	30.12	32.22	34.12	36 53	39.13	41.37	44. 5	46.40	49.21	50.51	59
60	2. 0	4. 0	6. 0	8. 1	10. 2	12. 4	14. 6	16.10	18.14	20.18	22.26	24.34	26.46	28.55	31. 9	33.27	35.47	38. 9	40.36	43.10	45.48	48.31	51.24	52.51	60
61	2. 3	4. 8	6.12	8.17	10.21	12.27	14.34	16.40	18.49	20.57	23.10	25.23	27.39	29.56	32.16	34.39	37. 5	39.36	42.11	44.52	47.40	50.35	53.42	55.17	61
62	2. 7	4.15	6.24	8.32	10.41	12.52	15. 2	17.14	19.28	21.42	23.59	26.17	28.37	31. 1	33.27	35.57	38.31	41.10	43.54	46 46	49.46	52.56	56.20	58. 4	62
63	2.12	4.24	6.37	8.50	11. 4	13.19	15.34	17.51	20. 9	22.27	24.51	27.15	29.44	32.12	34.45	37.23	40. 5	42.54	45.49	48 52	52. 7	55.36	59.24	61.22	63
64	2.17	4.33	6.51	9. 9	11.28	13.47	16. 8	18.30	20.54	23.18	25.48	28.19	30.52	33.30	36.11	38.57	41.49	44.49	47.57	51.17	54 50	58.43	63. 2	65.22	64
65	2.22	4.44	7. 6	9.30	11.54	14.19	16.45	19.13	21.43	24.13	26.50	29.28	32. 9	34.55	37.46	40.42	43.46	46.59	50.43	54. 2	57.59	62.26	67.36	70.33	65
66	2.27	4.55	7.23	9.25	12.21	14.53	17.26	20. 0	22.37	25.14	27.58	30.44	33.34	36.29	39.31	42.40	45.58	49.26	53.11	57.14	61.47	67. 4	73.52	78.25	66

TABLE XII. A Table of Latitudes and Longitudes.

Names of Places.	Cont.	Countries.	Coaſt.	Latitude.	Longitude.	H. Water.
A				° ′	° ′	
I. Abacco. N. point or Lucayos S. point	Am.	Bahama I.	Atl. Ocean	27 12 N. 26 15 N.	77 05 W. 77 01 W.	
Abbrevrak	Eu.	France	Eng. Channel	48 32 N.	4 15 W.	4h. 30m.
St. Abbſhead	Eu.	Scotland	Germ. Ocean	55 55 N.	1 56 W.	
I. Abdeleur	Africa	Anian	Indian Sea	11 55 N.	51 45 E.	
Aberdeen	Eu.	Scotland	Germ. Ocean	57 06 N.	01 44 W.	0 45
Abo	Eu.	Finland	Baltic Sea	60 27 N.	22 15 E.	
Abrolhos bank	Am.	Braſil	Atl. Ocean	18 22 S.	38 45 W.	
Abrollo Bank N. part	Am.	Bahama	Atl. Ocean	21 33 N.	69 50 W.	
Achen	Aſia.	I. Sumatra	Indian Ocean	5 15 N.	95 55 E.	
Aden	Aſia.	Arabia	Indian Sea	12 55 N.	45 35 E.	
I. Admiralties	Eu.	Nova Zem.	North Ocean	75 05 N.	52 50 E.	
Adventure Iſland	Aſia.	Soc. Iſles	Pacif. Ocean	17 6 S.	144 18 W.	
I. Agalega, or Galega	Africa.	Madagaſcar	Indian Ocean	10 15 S.	54 46 E.	
C. St. Agnes	Am.	Patagonia	S. Atl. Ocean	53 55 S.	66 29 W.	
Agra	Aſia.	India	Mogul's	26 43 N.	76 49 E.	
I. St. Auguſta	Eu.	Dalmatia	Adriatic Sea	42 40 N.	18 57 E.	
C. Ajuga	Am.	Peru	Pacific Ocean	6 38 S.	80 50 W.	
B. Algoa	Africa.	Caffers	Indian Ocean	25 30 S.	33 33 E.	
I. Aland	Eu.	Sweden	Baltic Sea	60 20 N.	21 30 E.	
Alaſhka Iſlands limits	Aſia		Pacif. Ocean	54 30 N. 55 40 N.	179 00 E. 178 30 W.	
R. Albany	Am.	New S. Wales	Hud. Bay	52 35 N.	85 18 W.	
I. Alboran	Africa.	Algiers	Medit. Sea	36 00 N.	2 27 W.	
Alactean Iſlands	Aſia		Pacif. Ocean	53 00 N.	166 00 E.	
Aldborough	Eu.	England	Germ. Ocean	52 20 N.	1 25 E.	9 45
I. Alderney	Eu.	England	Eng. Channel	49 48 N.	2 11 W.	12 00
Aleppo	Aſia.	Syria	Medit. Sea	35 45 N.	37 25 E.	
Alexandretta	Aſia.	Syria	Medit. Sea	36 35 N.	36 20 E.	
Alexandria	Africa.	Egypt	Medit. Sea	31 11 N.	30 17 E.	
I. Algeranca	Africa.	Canaries	Atl. Ocean	29 23 N.	15 53 W.	
Algiers	Africa.	Algiers	Medit. Sea	36 49 N.	2 18 E.	
Alicant	Eu.	Spain	Medit. Sea	38 34 N.	0 07 W.	
I. Alicur Lipari Iſ.	Eu.	Italy	Medit. Sea	38 31 N.	14 37 E.	
Alkoſir	Africa.	Egypt	Red. Sea	26 20 N.	34 41 E.	
B. All Saints, or Todos Sanctos	Am.	Braſil	Atl. Ocean	13 05 S.	38 45 W.	
Almeria	Eu.	Spain	Medit. Sea	36 51 N.	2 15 W.	
Iſ. Almirante, limits	Africa.	Zanguebar	Indian Sea	5 45 S. 4 30 S.	52 30 E. 55 40 E.	
St Alphonſo's Iſ.	Am.	T. del Fuego	Pacif. Ocean	55 51 S.	69 28 W.	
ltur	Aſia.	Arabia	Red Sea	28 20 N.	34 19 E.	
R. Amazons, mouths	Am.	Terra Firma	Atl. Ocean	0 30 S.	47 35 W. 49 20 W.	6 00
I. Amboyna	Aſia.	Molucca I.	Indian Ocean	4 25 N.	127 25 E.	
Ambrym	Aſia.	N. Hebrides	Pacif. Ocean	16 10 S.	168 12 E.	
Iſ. Ambroſa	Am.	Chili	Pacif. Ocean	26 40 S.	82 30 W.	
I. Ameyſand	Eu.	D. Neth.	Germ. Ocean	53 30 N.	6 20 E.	7 30
I. Amoy	Aſia.	China	Pacif. Ocean	24 30 N.	118 45 E.	
Amſterdam	Eu.	D. Neth.	Germ Ocean	52 23 N.	04 52 E.	3 00
I. Amſterdam	Aſia.	Madagaſcar	Indian Ocean	37 55 S.	75 15 E.	
I. Amſterdam, or Tonga-Tabu	Aſia.	Friendly Iſ.	Pacif. Ocean	21 05 S.	174 55 W.	8 30
I. Anabona	Africa.	Eth. Coaſt	Atl. Ocean	2 36 S.	5 35 E.	
Ancona	Eu.	Italy	Mediterran.	43 38 N.	13 31 E.	
Iſ. Andaman, limits	Aſia.	India	Bengal	14 00 N. 10 08 N.	93 05 E. 93 35 E.	
I. Andaro	Aſia.	India	Indian Ocean	10 00 N.	73 40 E	
I. St. Andro Sotovento,	Am.	Mexico	Atl. Ocean	12 30 N.	81 35 W.	
I. St. Andrean			Pacif. Ocean	61 35 N.	170 00 W.	
C. St. Andrea	Africa.	Madagaſcar	Indian Ocean	15 46 S.	45 22 E.	
St. Andrew's	Eu.	Scotland	Germ. Ocean	56 18 N.	2 [illegible] W.	2 15

A Table of Latitudes and Longitudes.

Names of Places.	Cont.	Countries.	Coaſt.	Latitude.	Longitude.	H. Water.
				° ′	° ′	
Iſ. Androſs N. point	Am.	Bahama	Atl. Ocean	25 00 N.	77 58 W.	
S. point				23 30 N.	77 00 W.	
Iſ. Angaſay	Africa.	Madagaſcar	Indian Ocean	17 00 S.	58 40 E.	
Andyr River			Pacif. Ocean	64 30 N.	172 00 E	
C. S, Angelo	Eu.	Turkey	Archipelago	36 27 N.	33 38 E.	
Mount St. Angelo	Eu.	Italy	Medit. Sea	41 42 N.	16 16 E.	
R. D'Angra	Africa.	Ethiopia	N. Atl. Ocean	01 00 N.	9 35 E.	
C. d'Anguilhas	Africa.	Caffers	Indian Ocean	34 50 S.	20 06 E.	
I. Anguilla	Am.	Antiles Iſ.	Atl. Ocean	18 15 N.	62 57 W.	
C. Anguille	Am.	Newfoundl.	Atl. Ocean	47 55 N.	59 11 W.	
I Anholt	Eu.	Denmark	Sound	56 40 N.	12 00 E.	oh. om.
C. Anne	Am.	New Eng.	Weſt. Ocean	42 50 N.	70 27 W.	
C. Q. Anne	Am.	Greenland	North Ocean	64 15 N.	50 30 W.	
Q. Anne's Foreland	Am.	N. Main	Hudſon's Str.	64 08 N.	74 36 W.	
Annmocka, or Rotterdam	Aſia	Friendly Iſ.	Pacif. Ocean	20 16 S.	174 30 W.	
Annapolis Royal	Am.	Nova Scotia	B. Fundy	44 52 N.	64 00 W.	
I. Antego	Am.	Caribbe Iſles	Alt. Ocean	16 57 N.	61 56 W.	
Antibes	Eu.	France	Medit. Sea	43 35 N.	7 09 E.	
I. Ante-coſt W. point	Am	Canada	B. St. Laurence	49 52 N.	64 04 W.	
E. point				49 10 N.	61 42 W.	
Antiochetta	Aſia	Syria	Medit. Sea	36 08 N.	36 17 E.	
C. d'Antiſer	Eu.	France	Eng. Channel	49 47 N.	0 34 E.	
C. Antonio	Am.	Iſle Cuba	Atl. Ocean	21 45 N.	84 05 W.	
I. St. Antonio	Africa	Cape Verd	Atl. Ocean	17 00 N.	25 02 W.	
C. St. Antony	Am.	Magellan	Atl. Ocean	36 45 S.	53 42 W.	
Antwerp	Eu.	Flanders	R. Scheld	51 13 N.	4 24 E.	6 00
B. Apalaxy	Am.	Florida	G. Mexico	30 00 N.	83 53 W.	
I. Apalioria	Aſia	India	Indian Ocean	9 08 S.	79 40 E.	
Aquapulco	Am.	Mexico	Pacif. Ocean	17 10 N.	101 40 W.	
Aquatulco	Am.	Mexico	Pacif. Ocean	15 27 N.	96 03 W.	
Archangel	Eu.	Ruſſia	White Sea	64 34 N.	38 30 E.	6 00
I. d'Areas	Am.	Mexico	G. Mexico	20 45 N.	92 35 W.	
Arica	Am.	Peru	Pacif. Ocean	10 27 S.	71 05 W.	
I. Arran	Eu.	Ireland	St. Geo. Ch.	54 48 N.	8 59 W.	11 00
I. Aſcenſion	Am.	Braſil	Atl. Ocean	7 59 S.	14 28 W.	
I. Aſſinaria, Sardinia	Eu.	Italy	Medit. Sea	41 06 N.	8 36 E.	
R. Aſhley	Am.	Carolina	Atl. Ocean	33 22 N.	79 50 W.	0 45
R. Aſſene	Africa	Guinea	Atl. Ocean	5 30 N.	2 20 W.	
I. Aſtorea	Africa	Madagaſcar	Indian Ocean	10 22 S.	53 25 E.	
Athens	Eu.	Turkey	Archipelago	37 40 N.	23 52 E.	
Atkin's Key	Am.	Bahama Iſles	Atl. Ocean	22 07 N.	74 26 W.	
Atwood's Keys	Am.	Bahama Iſles	Atl. Ocean	21 22 N.	72 40 W.	
C. Ava	Aſia	Japan	Pacif. Ocean	34 45 N.	141 00 E.	
Iſ. Aves, Sotovent	Am.	Terra Firma	Atl. Ocean	15 26 N.	66 15 W.	
C. St. Auguſtine	Am.	Braſil	Atl. Ocean	8 48 S	35 00 W.	
C. St. Auguſtine	Aſia	Mindanao	Pacif. Ocean	6 40 N.	126 25 E.	
St. Auguſtine	Am.	Florida	Atl. Ocean	30 10 N.	81 29 W.	7 30
Aurora	Aſia	N. Hebrides	Pacif. Ocean	15 8 S.	168 17 E.	
Aydhab	Africa	Egypt	Red Sea	21 53 N.	36 26 E.	
Aylah	Aſia	Arabia	Red Sea	29 08 N.	35 41 E.	
B						
Babelmondel Straits	Africa	Abyſſinia	Red Sea	12 50 N.	43 50 E.	
C. Baba	Aſia	Natolia	Archipelago	39 33 N.	26 22 E.	
I. Bachian	Aſia	Molucca Iſles	Pacif.	00 40 N.	123 00 E.	
I. Bahama	Am.	Bahama Iſles	Atl. Ocean	26 45 N.	78 35 W.	
Bahama Bank, N. pt.	Am.	Bahama Iſles	Atl. Ocean	27 50 N.	78 43 W.	
C. Bajador	Africa	Negroland	Atl. Ocean	[illegible] 29 N.	14 36 W.	
Baker's Dozen	Am.	Labrador	Hudſon's Bay	57 0 N.	[illegible]	
Balaſor	Aſia	India	B. Bengal	21 20 N.	86 00 E.	
Baldivia	Am.	Chili	Pacif. Ocean	39 38 S.	73 20 W.	
I. Bali	Aſia	Sunda	~~Indian Ocean~~	8 05 S.	114 30 E.	

Baltimore

A Table of Latitudes and Longitudes.

Names of Places.	Cont.	Countries.	Coaſt.	Latitude.	Longitude.	H. Water.
				° ′	° ′	
Baltimore	Eu.	Ireland	Weſt Ocean	51 16 N.	9 26 W.	4 30
I. Banca S. end	Aſia	Sunda	Indian Ocean	3 15 S.	107 10 E.	
N. W. end				1 50 S.	105 30 E.	
I. Banda	Aſia	Molucca Iſles	Indian Ocean	4 30 N.	127 25 E.	
Banjar	Aſia	I. Borneo	Indian Ocean	2 27 S.	113 50 E.	
Bank's Iſle	Aſia	N. Zealand	Pacif. Ocean	43 45 S.	172 40 E.	
Bantam	Aſia	I. Java	Indian Ocean	6 15 S.	106 25 E.	
B. Bantry	Eu.	Ireland	Atl. Ocean	51 45 N.	10 46 W.	
I. Barbadoes Bridge town	Am	Carabbe Iſles	Atl. Ocean	13 00 N.	59 50 W.	
C. Barbas	Africa	Sanaga	N. Atl. Ocean	21 50 N.	16 26 W.	
I. Barbuda	Am.	Carabbe Iſles	Atl. Ocean	17 46 N.	61 47 W.	
C. Barcam	Eu.	Greenland	North Ocean	78 18 N.	20 06 E.	
Barcelona	Eu.	Spain	Medit. Sea	41 26 N.	2 18 E.	
C. Barfleur	Eu.	France	Eng. Channel	49 38 N.	1 16 W.	7h. 30m.
Bargazar Point	Eu.	Iceland	North Ocean	66 30 N.	17 12 W.	
I. Bardſey	Eu.	Wales	St. Ceo. Ch.	52 44 N.	5 00 W.	
C. Barſo	Eu.	Ruſſia	White Sea	66 30 N.	38 00 E.	
I. Bartholomew	Am.	Carabbe Iſles	Atl. Ocean	17 56 N.	63 11 W.	
I. de Bas	Eu.	France	Eng. Channel	48 50 N.	4 00 W.	3 45
Baſſora	Aſia	Arabia	Perſian Gulf	29 45 N.	47 40 E.	
C. Baſſos, or Baxos	Africa	Anian	Indian Sea	4 12 N.	47 07 E.	
Baſſos de Banhos	Africa	Zanguebar	Indian Ocean	5 00 S.	48 08 E.	
Baſſos de Chagos	Aſia	India	Indian Ocean	6 42 S.	68 20 E.	
I. Baſſus des Indes	Africa	Zanguebar	Indian Ocean	21 19 S.	41 43 E.	
Batavia	Aſia	I. Java	Indian Ocean	6 12 S.	106 45 E.	
Bayonne	Eu.	France	B. Biſcay	43 30 N.	1 30 W.	3 30
Bayonna Iſles	Eu.	Spain	Atl. Ocean	41 45 N.	9 01 W.	
Beachy Head	Eu.	England	Eng. Channel	50 44 N.	0 25 E.	0 00
Bear-bay	Eu.	Greenland	North Ocean	79 10 N.	24 15 E.	
N. Bear	Am.	Labradore	Hudſon's Bay	54 40 N.	85 0 W.	12 00
S. Bear				54 25 N.		
I. Beerenberg	Eu.	———	North Ocean	71 45 N.	4 30 E.	
Beering's Iſ.	Aſia		Pacif. Ocean	54 57 N.	164 49 E.	
Belcher's Iſles	Am.	Laboadore	Hudſon's Bay	56 0 N.	83 4 W.	
Belfaſt	Eu.	Ierland	Iriſh Sea	54 43 N.	5 52 W.	10 00
Belliſle	Eu.	France	B. Biſcay	47 21 N.	3 13 W.	3 30
Belliſle	Am.	Newfound.	Atl. Ocean	51 55 N.	55 25 W.	
Bembridge Point	Eu.	Iſle Wight	Eng. Channel	50 41 N.	1 5 W.	
Straits of Belliſle	Am.	Newfound.	Atl. Ocean	51 48 N.	56 00 W.	
Bell Sound	Eu.	Greenland.	North Ocean	77 45 N.	112 40 E.	
Bencola	Aſia	I. Sumatra	Indian Ocean	4 00 S.	02 55 E.	
Bengal	Aſia	India	B. Bengal	22 00 N.	92 45 E.	
Bergen	Eu.	Norway	Weſtern Oc.	60 10 N.	6 14 E.	
Berlin	Eu.	Germany	R. Elbe	52 33 N.	13 26 E.	
I. Bermudas	Am.	Bahama Iſles	Atl. Ocean	32 35 N.	63 32 W.	7 00
I. Bermaja	Am.	Mexico	G. Mexico	21 40 N.	92 53 W.	
Berwick	Eu.	England	Germ. Ocean	55 45 N.	1 50 W.	2 30
Berry Point	Eu.	England	Eng Channel	50 37 N.	3 49 W.	
Birds Iſland	Am.	Acadia	G. St. Lawr.	47 44 N.	60 24 W.	
Bilboa	Eu.	Spain	B. Biſcay	43 26 N.	3 18 W.	
I. du Bick	Am.	Acadia	R. St. Lawr.	48 30 N.	68 36 W.	2 0
Blackney	Eu.	England	Germ. Ocean	53 20 N.	0 55 E	6 00
Black Point	Eu.	Greenland	North Ocean	78 00 N.	10 50 E.	
Black Iſle	Eu.	Nova Zem.	North Gcean	72 52 N.	52 35 E.	
C. Blanco	Africa	Negroland	Atl. Ocean	20 45 N.	17 23 W.	9 45
C. Blanco	Am.	Patagonia	Atl. Ocean	47 07 S.	64 05 W.	
C. Blanco	Eu.	Greenland	North Ocean	77 58 N.	20 04 E.	
C. Blanco	Am.	Mexico	Pacif. Ocean	9 42 N.	85 55 W.	
I. Blanco, Sotovento	Am.	Terra Firma	Atl. Ocean	11 42 N.	64 20 W.	
Blanchart Race	Eu.	France	Eng. Channel	49 42 N.	2 08 W.	0 00
Blaſques	Eu.	Ireland	Atl. Ocean	52 00 N.	10 56 W.	

A Table of Latitudes and Longitudes.

Names of Places.	Con.	Countries.	Coaſt.	Latitude.	Longitude	H. Water
				° ′	° ′	
Blavet, or Port Louis	Eu.	France	B. Biſcay	47 45 N.	3 13 W.	3h. 0m.
Bocachica	Am.	Terra Firma	Caribb. Sea	10 20 N.	75 30 W.	
Bolabola	Aſia	Society Iſl.	Pacif. Ocean	16 33 S.	151 52 W.	
R. Bolſhaya	Aſia	Siberia	Pacif. Ocean	52 48 N.	157 00 E.	
I. Bombay	Aſia	India	Indian Ocean	19 42 N.	73 03 E.	
Bona	Africa	Tunis	Mediterran.	37 08 N.	7 10 E.	
C. Bona	Africa	Tunis	Mediterran.	37 10 N.	10 00 E.	
C. Bona viſta	Am.	Newfoundl.	Atl. Ocean	48 34 N.	52 33 W.	
I. Bona viſta	Africa	C. Verd Iſles	Atl. Ocean	16 05 N.	22 40 W.	
C. Bona fortuna	Eu.	Ruſſia	White Sea	65 35 N.	38 25 E.	
I. Bonayre, Sotovent	Am.	Terra Firma	Atl. Ocean	11 52 N.	67 20 W.	
B. Bonaventura	Am.	Terra Firma	Pacif. Ocean	3 18 N.	76 50 W.	
C. Bon Eſperance	Africa	Caffers	Indian Ocean	34 29 S.	18 23 E.	3 00
Cape Town	Africa	Caffers	Atl. Ocean	33 55 S.	18 23 E.	2 30
Bourdeaux	Eu.	France	B. Biſcay	44 50 N.	0 35 W.	3 00
I. Borneo Eaſt point	Aſia		Indian Ocean	1 12 N.	117 10 E.	
Weſt point				3 15 N.	108 57 E.	
North point				7 05 N.	113 40 E.	
South point				3 32 S.	112 05 E.	
I. Borneo Borneo	Aſia		Indian Ocean	5 00 N.	112 15 E.	
Succadano				0 50 S.	108 35 E.	
I. Bornholm	Eu.	Sweden	Baltic Sea	55 12 N.	15 50 E.	
Boſton	Eu.	England	Germ. Ocean	53 10 N.	0 25 E.	
Boſton	Am.	New England	Atl. Ocean	42 25 N.	70 37 W.	
Botany Iſl.	Aſia	N. Caledonia	Pacif. Ocean	22 27 S.	167 17 E.	
Botany Bay	Aſia	N. Holland	Pacif. Ocean	34 00 S.	151 28 E.	
Boulogne	Eu.	France	Eng Channel	50 44 N.	1 40 E.	10 30
I. Bourbon St. Den	Africa	Madagaſcar	Indian Ocean	20 52 S.	55 35 E.	
I. St. Brandon	Africa	Madagaſcar	Indian Ocean	16 45 S.	64 48 E.	
B. Brandwyns	Eu.	Greenland	North Ocean	79 50 N.	26 20 E.	
I. Bravas	Africa	C. Verd	Atl. Ocean	14 54 N.	24 45 W.	
Bremen	Eu.	Germany	R. Weſer	53 30 N.	9 00 E.	6 00
Breeſound, a ſand	Eu.	D. Neth	Germ. Ocean	53 12 N.	5 15 E.	4 30
Breſlau	Eu.	Sileſia	R. Oder	51 03 N.	17 13 E.	
Breſt	Eu.	France	B. Biſcay	48 23 N.	4 30 W.	3 45
B. Breſt	Am.	New Britain	Weſt Ocean	52 10 N.	52 30 W.	
Cape Bret	Aſia	N. Zealand	Pacif. Ocean	35 07 S.	173 52 E.	
Bridge Town	Am.	I. Barbadoes	Atl. Ocean	13 00 N.	59 50 W.	
Bridlington Bay	Eu.	England	Germ. Ocean	54 07 N.	00 04 E.	3 45
Brill	Eu.	D. Neth	Germ. Ocean	51 56 N.	4 10 E.	1 30
Brionſle	Am.	Acadia	G. St. Lawr.	47 50 N.	60 47 W.	
Briſtol	Eu.	England	St. Geo. Ch.	51 28 N.	2 30 W.	6 45
C. Briſtol	Am.	Sandwich L.	Atl. Ocean	59 2 S.	26 51 W.	
I. Cape Britain Louiſbourgh	Am.	Acadia	Atl. Ocean	45 54 N.	59 55 W.	
I. Scateri				46 01 N.	61 57 W.	
North Cape				47 05 N.	60 8 W.	
New Britain I. Mathias	Aſia	New Guinea	Pacif. Ocean	2 00 S.	147 50 E.	
North point				2 30 S.	148 40 E.	
S. W. point				6 00 S.	146 37 E.	
Strait Dampier				6 15 S.	146 15 E.	
C. St. George				5 30 S.	150 55 E.	
I. St. John				4 20 S.	152 40 E.	
Buchaneſs	Eu.	Scotland	Germ. Ocean	57 20 N.	1 23 W.	3 00
Buenos Ayres	Am.	Braſil	Atl. Ocean	34 35 S.	58 00 W.	
C. Buller	Am.	S. Georgia	Atl. Ocean	53 58 S.	37 40 W.	
Burgaford point	Eu.	Iceland	North Ocean	63 03 N.	16 34 W.	
Burgeo Iſles	Am.	Newfoundl.	Atl. Ocean	47 36 N.	57 31 W.	
Burlings, rocks	Eu.	Portugal	Atl. Ocean	39 37 N.	9 35 W.	
Burlington	Eu.	England	Germ Ocean	54 00 N.	0 08 E.	
Button's Iſles	Am.	New Britain	Hudſ. Straits	60 35 N.	65 20 W.	6 50

A Table of Latitudes and Longitudes.

Names of Places.	Cont.	Countries.	Coaſt.	Latitude.	Longitude	H. Water.
				° '	° '	
Cape Byron	Aſia	N. Zeland	Pacif. Ocean	28 39 S.	153 31 E.	
Byron's Iſle	Aſia		Pacif. Ocean	1 18 S.	170 6 W.	
C						
I. Cabrera	Eu.	Italy	Mediterran.	43 10 N.	9 11 E.	
Cadis	Eu.	Spain	Atl. Ocean	36 31 N.	6 07 W.	4 30m
Caen	Eu.	France	Eng. Channel	49 11 N.	0 22 W.	9 00
Cagliari, I. Sardinia	Eu.	Italy	Medit. Sea	39 25 N.	9 38 E.	
Cajanebourg	Eu.	Finland	Baltic Sea	64 13 N.	27 51 E.	
Iſles Caicos, or Cankroſs, from	Am.	Bahama Iſles	Atl. Ocean	21 27 N. 22 5 N.	71 24 W. 72 15 W.	
Calabar, Old New	Africa	Guinea	Eth. Ocean	4 30 N. 5 00 N.	8 10 E. 7 00 E.	
C. Calaberno	Aſia	Natolia	Archipelago	38 42 N.	26 44 E.	
Calais	Eu.	France	Eng. Channel	50 58 N.	01 51 E.	11 30
C. Calamadon	Aſia	India	B. Bengal	10 22 N.	80 40 E.	
Caldera	Aſia	I. Mindano	Pacif. Ocean	7 00 N.	121 25 E.	
I. Caldy	Eu.	England	St. Geo. Ch.	51 33 N.	5 14 W.	5 15
Calicut	Aſia	India	Indian Ocean	11 15 N.	75 39 E.	
Cairo	Africa	Egypt	R. Nile	30 02 N.	31 26 E.	
Callao	Am.	Peru	Pacif. Oceen	12 2 S.	76 58 W.	
I. Great Camanis	Am.	Weſt Indies	Atl. Ocean	19 18 N.	80 29 W.	
I. Little Camanis	Am.	Weſt Indies	Atl. Ocean	19 42 N.	79 20 W.	
Camboida	Aſia	India	Indian Ocean	10 35 N.	104 45 E	
Cambridge	Eu.	England		52 13 N.	0 4 E.	
Cambridge	Am.	N. England		42 25 N.	71 10 W.	
C. Cambron, or Carbon	Africa	Algiers	Medit. Sea	37 18 N.	4 58 E.	
C. Cameron	Am.	New Spain	Atl. ocean	15 35 N.	83 29 W.	
R. Camerones	Africa	Guinea	Atl. ocean	3 30 N.	9 10 E.	
B. Camerones	Am.	Magellan	Atl. ocean	44 50 S.	67 10 W.	
Camfer, a ſand	Eu.	D. Neth	Germ. ocean	53 33 N.	5 30 E	1 30
Camin	Eu.	Germany	Baltic	54 04 N.	15 40 E.	
C. Campell	Aſia	N. Zeland	Pacif. ocean	41 51 N.	174 41 E.	
Compeachy	Am.	Yucatan	Atl. ocean	19 36 N.	90 53 W.	
I. Canaria	Africa	Canaries	Atl. ocean	28 01 N.	15 30 W.	3 0
C. Candenoſe	Eu.	Ruſſia	North ocean	69 25 N.	45 30 E.	
I. Candia: C. St. John W. end Candia C. Solomon, E. end	Eu.	Turkey	Medit. Sea	35 12 N. 35 19 N. 34 57 N.	23 54 E. 25 23 E. 27 06 E.	
Candia	Aſia	I. Celon	Indian ocean	7 54 N.	81 53 E.	
Candlemas Iſles	Am.	Sandwich L	Atl. ocean	57 10 S.	27 13 W.	
I. Candu	Aſia	India	Indian ocean	7 30 S.	77 55 E.	
C. Canſo	Am.	Nova Scotia	Atl. ocean	45 18 S.	60 48 W.	
Canſo Paſſage	Am.	Nova Scotia	Atl. ocean	45 30 S.	61 00 W.	
C. Cantin	Africa	Barbery	Atl. ocean	32 41 S.	9 01 W.	0 00
Cantire Mul	Eu.	Scotland	Weſt ocean	55 22 S.	5 45 W.	
Canton	Aſia	China	Pacif. ocean	23 08 N.	113 02 E.	
Cape Town	Africa	Caffers	Atl. ocean	33 55 S.	18 23 E.	2 30
I. Capri	Eu.	Italy	Medit Sea	40 34 S.	14 11 E.	
I. Capraya	Eu.	Italy	Medit. Sea	43 03 S.	10 15 E.	
C. Carapar	Aſia	India	B. Bengal	19 22 S.	86 05 E.	
Caraccas	Am.	Terra Firma	Atl. ocean	10 06 S	66 45 W.	
Caries, or Hacluits Iſles	Am.	Greenland	Baffing's Bay	77 15 S.	62 00 W.	
Carinda Point	Am.	California	Pacif. ocean	38 24 S.	124 25 W.	
Carliſle	Eu.	England	Iriſh Sea	54 47 S.	2 35 W.	
C. Carmel	Aſia	Syria	Levant	33 08 S.	35 35 E.	
Caroline Iſles, limits	Aſia	————————	Pacif. ocean	7 10 S. 12 00 S.	137 25 W. 127 25 E.	

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A Table of Latitudes and Longitudes.

Names of Places.		Cont.	Countries.	Coaſt.	Latitude.	Longitude.	H. Water.
					° '	° '	
Iſ. St. Carlos		Aſia.	——	South Sea	54 40 N.	139 30 W.	
C. Carthage		Afric	Barbary	Medit. Sea	36 52 N.	10 31 E.	
Carthagena		Am.	Terra Firma	Carubbean Sea	10 27 N.	75 26 W.	
Carthagene		Eu.	Spain	Medit. Sea	37 37 N.	1 03 W.	
Carteret's Iſle		Aſia.	New Britain	Pacif. Ocean	8 26 S.	159 14 E.	
Cay's Swan's Neſt		Am.	——	Hudſon's Bay	62 20 N.	83 30 W.	8h. 15m.
Caſkets		Eu.	I. Guernſey	Eng. Channel	49 50 N.	2 26 W.	
C. Caſſander		Eu.	Turkey	Archipelago	40 02 N.	23 41 E.	
I. St. Catherines		Am.	Braſil	Atl. Ocean	27 45 N.	47 58 W.	
Cat Iſle	N. point	Am.	Bahama	Atl. Ocean	24 50 N.	75 35 W.	
	S. point				23 48 N.	75 35 W.	
Cathneſs Point Dinnet Head		Eu.	Scotland	Weſt Ocean	58 42 N.	3 17 W.	9 00
Catena		Eu.	I. Sicily	Medit. Sea	42 40 N.	20 30 E.	
C. Catocha		Am.	New Spain	Caribbean Sea	20 48 N.	86 35 W.	
I. Cayenne		Am.	Terra Firma	Atl. Ocean	4 56 N.	52 15 W.	
I. Celebes	N. E. point	Aſia.	Spice Iſles	Indian Ocean	1 48 N.	124 37 E.	
	W. point				3 00 S.	117 55 E.	
	S. W. point Macaſſer				5 11 S.	117 50 E.	
	S. point				5 40 S.	119 55 E.	
	S. E. point				5 20 S.	121 58 E.	
I. Cephalonia		Eu.	Turkey	Medit. Sea	88 20 N.	20 11 E.	
Ceuta		Africa.	barbary	Medit. Sea	35 49 N.	5 25 W.	
I. Ceylon	Infanapatam, N. purt	Aſia.	India	Indian Ocean	9 47 N.	80 55 E.	
	Trinquemale, S. E. end				8 40 N.	81 40 E.	
	C. Galio, S. W. end.				6 27 N.	82 10 E.	
					6 15 N.	80 20 E.	
Chain Iſland		Aſia.	Society Iſles	Pacif. Ocean	17 25 S.	145 30 W.	
Chandenagar		Aſia.	Bengal	River Ganges	22 51 N.	88 34 E.	
Charles Town		Am.	Carolina	Aſhley River	33 22 N.	79 50 W.	3 00
C. Charles		Am.	Virginia	Atl. Ocean	37 11 N.	76 07 W.	
I. of Charles	Eaſt End	Am.	Labrador	Hudſſon's Bay	62 46½ N.	74 15 W.	
	Weſt End				62 48 N.	75 30 W.	10 15
C. Charles		Am.	New Britain	Weſt Ocean	51 50 N.	151 10 W.	
Charlotte's Iſles		Aſia.	Guadalcanal	Pacif. Ocean	11 0 S.	64 0 E.	
Charlotte		Am.	S. Georgia	Atl. Ocean	54 32 S.	136 12 W.	
Q. Charlotte's Sound		Aſia.	N. Zealand	Pacif. Ocean	41 6 S.	174 19 E.	9 00
Q. Charlotte's Foreld.		Aſia.	N. Caledonia	Pacif. Ocean	22 15 S.	67 13 E.	
I. Charlton		Am.	New Wales	Hudſon's Bay	52 03 N.	81 00 W.	
Chatteaux Bay		Am.	Labrador	Atl. ocean	52 1 N.	55 50 W.	
B Chebucto		Am.	Nova Scotia	Atl. Ocean	44 45 N.	63 18 W.	
Chiegnecto		Am.	Nova Scotia	B. Fundy	46 15 N.	63 11 W.	0 45
Cherbuurgh		Eu.	France	Eng. Channel	49 38 N.	01 33 W.	7 30
Cherry Iſle		Eu.	Greenland	North Ocean	74 35 N.	18 05 E.	
Cheſter		Eu.	England	Iriſh Sea	53 10 N.	2 25 W.	
Chiddock		Eu.	England	Eng. Channel	50 47 N.	3 00 W.	
C. Chidley		Am.	New Britain	Hudſ. Straits	60 22 N.	65 00 E.	
I. Chiloe	N. point	Am.	Patagonia	Pacif. Ocean	41 45 S.	173 05 W.	
	S. point				43 50 S.		
C. Chiokotſkago		Aſia.	Siberia	North Ocean	64 00 N.	174 45 W.	
Chriſtiana		Eu.	Norway	Sound	59 25 N.	10 30 E.	
Chriſtianople		Eu.	Sweden	Baltic Sea	55 55 N.	15 10 E.	
Chriſtianſtadt		Eu.	Sweden	G. Bothnia	63 47 N.	22 50 E.	
Chriſtmas Sound		Am.	T. del Fuego	Pacif. Ocean	55 22 S.	70 01 W.	2 30
I. St. Chriſtopher's		Am.	Carib Iſles	Atl. Ocean	17 20 N.	62 54 W.	
R. St. Chriſtopher's		Africa.	Caffers	Indian Ocean	32 47 S.	30 00 E.	
C. Chukchenſe		Aſia.	Siberia	North Ocean	66 30 N.	171 10 W.	
C. Churchill		Am.	New Wales	Hudſon's Bay	58 48 N.	93 17 W.	
R. Churchill					58 47½ N.	94 08 W.	7 20

A Table of Latitudes and Longitudes.

Names of Places.	Con.	Countries.	Coaſt.	Latitude.	Longitude.	H Water.
				° '	° '	
I. Chuſan	Aſia	China	Chineaſe Sea	30 00 N.	121 50 E.	
Civita Vecchia	Eu.	Italy	Medit. Sea	42 5 N.	11 51 E.	
C. Cleare	Eu.	Ireland	Weſt Ocean	51 18 N.	9 50 W.	4h. 30m.
Clerk's Iſles	Am.	S. Georgia	Atl. Ocean	55 6 S.	34 42 W.	
I. Cloate	Aſia	India	Indian Ocean	22 00 S.	95 40 E.	
Cochin	Aſia	India	Indian Ocean	9 50 N.	76 05 E.	
I. Cocos	Aſia	India	Indian Ocean	12 20 S.	8 10 E.	
I. Cocos	Am.	Mexico	Pacif. Ocean	5 00 N.	88 45 W.	
C. Cod	Am.	New England	Atl. Ocean	42 15 N.	69 27 W.	
Colcheſter	Eu.	England	Germ. Ocean	52 00 N.	0 55 E.	
C. Cold	Eu.	Greenland.	North Ocean	79 00 N.	10 00 E.	
C. Colnet	Aſia	N. Caledonia	Pacif. Ocean	20 30 S.	164 56 E.	
R. Colerado	Am.	New Spain	G. California	31 40 N.	115 25 W.	
I. Colgau	Eu.	Ruſſia	North Ocean	69 20 N.	45 00 E	
Collioure	Eu.	Spain	Medit. Sea	42 31 N.	3 10 E.	
C. Colone	Eu.	Turky	Archipelago	37 43 N.	24 41 E.	
C. Colone	Aſia	Natolia	Archipelago	39 10 N.	27 04 E.	
C. Colonni	Eu.	Italy	Medit. Sea	38 56 N.	18 05 E.	
C. Colville	Aſia	N. Zeland	Pacif. Ocean	36 27 S.	174 48 E.	
Comana	Am.	Terra Firma	Atl. Ocean	10 00 S.	65 07 W	
C. Comaria	Aſia	India	Indian Ocean	7 45 S.	78 17 E.	
C. Comfort	Am.	New Wales	Hud. Bay	64 45 N.	82 30 W.	
Concarneau	Eu.	France	B. Biſcay	47 54 N.	3 50 W.	3 00
C. Conception	Am.	California	Pacif. Ocean	35 40 N.	126 02 W.	
B Conception Entra	Am.	Newfound.	Atl. Ocean	48 25 N.	50 07 W.	
Conception	Am.	Chili	Pacific Ocean	36 43 S.	73 13 W.	
R. Congo	Africa	Congo	Eth. ocean	5 45 S.	11 53 E.	
I. Coningen	Aſia	N. Zealand	Pacif. Ocean	34 30 N.	164 25 E.	
Coningſburgh	Eu.	Poland	Baltic Sea	54 44 N.	21 53 E.	
Conquet	Eu.	France	Eng. Channel	48 30 N.	4 35 W.	2 15
C. Conquibaco	Am.	Terra Firma	Atl. Ocean	12 15 N.	69 57 W.	
Conſtantinople	Eu.	Turky	Archipelago	41 00 N.	28 53 E.	
Cook's Straits	Aſia	N. Zealand	Pacif. Ocean	41 6 S.	174 30 E.	
Cooper's Iſle	Am.	S. Georgia	Atl. Ocean	54 57 S.	36 64 W.	
Copenhagen	Eu.	Denmark	Baltic Sea	55 41 N.	12 50 E.	
Coperwic	Eu.	Norway	Sound	59 20 N.	10 10 E.	
I. Copland	Eu.	Iceland	Iriſh Sea	54 40 N.	6 40 W.	
I. Coquet	Eu.	England	Germ. Ocean	55 20 N.	1 25 W.	3 00
R. Coquimbo	Am.	Chili	Pacif. Ocean	29 54 S	71 10 W.	
C. Corbau	Aſia	Natolia	Archipelago	38 03 N.	26 58 E.	
Cordoue	Eu.	France	B. Biſcay	45 30 N.	01 10 W	
Corea, South limit	Aſia	China	Pacif. ocean	34 50 N.	124 25 E. 127 25 E	
I. Corſu	Eu.	Turky	Mediterran.	39 50 N.	19 48 E.	
C. Corientes	Africa	Caffers	Indian Ocean	24 08 S.	36 49 E.	
C. Corientes	Am.	Mexico	Pacif. ocean	20 18 N.	108 00 W.	
Corinth	Eu.	Turky	Archipelago	37 30 N.	23 00 E.	
Corke	Eu.	Ireland	St. Geo. Ch.	51 54 N.	8 30 W.	6 30
C. Coronation	Aſia	N. Caledonia	Pacif. ocean	22 5 S.	167 8 E.	
C Corſe	Africa	Guinea	Eth. Sea	5 12 N.	0 23 W.	3 30
Corſica { C. Corſo, North point	Eu.	Italy	Mediterran.	42 53 N.	9 40 E.	
Corſica { Bonfacio, South point				41 22 N.	9 26 E.	
I. Corvo	Eu.	Azores	Atl. Ocean	39 42 N.	31 02 W.	
I. Coſmoledo	Africa	Madagaſcar	Indian Ocean	10 28 S.	51 42 E.	
I. Coudre	Am.	Canda	R. St. Lawr.	47 31 N.	69 2 W.	
Cow and Calf	Eu.	Ierland	Weſt ocean	51 22 N.	10 30 W.	
I. Cozurrel	Am.	Yucatan	Atl. Ocean	19 36 N.	86 35 W.	
R. Crocei	Aſia	China	N. Nankin	34 06 N.	120 10 E.	
Cromer	Eu.	England	Germ. Ocean	53 05 N.	0 56 E.	7 00
Crooked I. N. point	Am.	Bahama	Atl. Ocean	22 47 N.	73 50 W.	

Croſs

A Table of Latitudes and Longitudes.

Names of Places.	Cont.	Countries.	Coaſt.	Latitude.	Longitude.	H. Water.
				° '	° '	
Cook's Straits	Aſia	New Zealand	South Sea	41 30 S.	175 00 E.	
Cook's Harbour	Am.		South Sea	49 00 N	124 30 W.	
Croſs point	Eu.	Nova Zem.	North Ocean	72 00 N	53 12 E.	
St. Cruz	Africa.	Barbary	Atl. Ocean	10 36 N	9 35 W.	
I. St. Cruz	Am.	Anilles I.	Atl. Ocean	37 53 N	64 55 W.	
Iſl. Cuba: C. Antonio W. point	Am.	Antilles I.	Atl. Ocean	21 45 N	84 05 W.	
P. de Mais-E. point				20 03 N	74 52 W.	
Hollow Cope				19 42 N	77 25 W.	
Iſl. Cuba: St. Jago	Am.	Antilles I.	Atl. Ocean	20 03 N	75 51 W.	
St. Mary				21 26 N	78 10 W.	
Le St. Eſpirit				21 56 N	79 50 W.	
Havannah				23 12 N	81 45 W.	
B. Hondy				22 54 N	82 40 W.	
Cubbs Iſles	Am.	New Wales	Hudſon's Bay	54 15 N	82 34 W.	
Cubello	Aſia	Ind. Malab.	Indian Ocean	7 50 N	71 55 E.	
C. Cumberland	Aſia	N. Hebrides	Pacif. Ocean	14 40 S.	166 47 E.	
Cumberland Iſles	Aſia	Society Iſles	Pacif. Ocean	19 18 S.	140 36 E.	
B. Cumberland	Am.	North Main	Davis's Str.	66 40 N.	60 20 W.	
Curaſſoa	Am.	Terra Firma	Atl. Ocean	11 56 N.	60 20 W.	
I. Cuzzola	Eu.	Turkey	Medit. Sea	42 50 N.	15 55 E.	
Cuſco	Am.	Pu	Inland	12 25 S.	75 35 W.	
I. Cypreſs: C. Baffa, W. end	Aſia	Syria	Medit. Sea	35 04 N.	34 04 E.	
C. St. Andr. E. end				35 40 N.	35 08 E.	
C. de Gaffe, S. point				34 35 N.	33 41 E.	
C. Grego, S. E. point				34 57 N.	34 36 E.	
D						
Dabul	Aſia	India	Arabian Sea	18 24 N.	33 33 E.	
Dahlak	Aſia	Arabia	Red Sea	15 50 N.	44 44 E.	
Iſles of Danger	Aſia	Society Iſles	Pacif. Ocean	10 15 S.	165 50 W.	
I. Dageroort Light-houſe	Eu.	Livonia	Baltic Sea	58 55 N	22 32 E	
Dantzic	Eu.	Poland	Baltic Sea	54 22 N.	18 36 E.	
Str. Dardanels	Eu.	Turkey	Archipelago	40 10 N.	26 26 E.	
Gulph Darien	Am.	Terra Firma	Carribbean Sea	8 45 N.	76 35 W.	
Dartmouth	Eu.	England	Eng Channel	50 27 N.	3 36 W.	6h. 30m
I. Dauphin	Am.	Louſiana	G. Mexico	29 40 N.	87 53 W.	
St. David's Head	Eu.	Wales	St. Geo. Ch.	51 55 N.	5 22 W	6 00
Fort St. David's	Aſia.	India	Corom. Coaſt	12 05 N.	80 55 E.	
Deal	Eu.	England	Downs	51 14 N.	1 30 E.	1 30
I. Deſeada	Am.	Carabbe Iſles	Atl. Ocean	16 36 N.	61 10 W.	
C. Deſeada	Am.	T. del Furgo	Pacif. Ocean	53 4 S.	74 18 W.	
C. Deſire	Eu.	Nova Zem.	North Ocean	77 45 N.	79 20 E.	
C. Deſolation	Am.	Greenland	North Ocean	61 45 N.	47 00 W.	
Devil's Iſles	Eu.	Greenland	North Ocean	80 00 N.	11 43 E.	
Dewpoint	Aſia.	India	B. Bengal	16 07 N.	81 47 E.	
I. Diego Rayes	Aſia.	Ind. Malab,	Indian Ocean	0 45 S. 0 30 N.	70 25 E. E.	
I. Diego Garcia	Africa.	India	Indian Ocean	8 45 S.	68 10 E.	
Str. Diemen	Aſia	Japan Iſles	Pacif. Ocean	31 12 N.	130 55 E.	
I. Dieu	Eu.	France	B. Biſcay	46 26 N.	2 20 W.	
Dieppe	Eu.	France	Eng. Channel	49 55 N.	1 12 E.	10 30
Diegge's, or Dudley's Cape	Am.	Greenland	Baffing's Bay	76 48 N.	59 30 W.	
C. Diggs	Am.	Labraore	Hudſon's Bay	62 45 N.	78 50 W.	
Po. Diu	Aſia	India	Indian Ocean	21 37 N.	70 28 E.	
C. Dobbs	Am.	North Wales	Hudſon's Bay	65 10 N.	86 25 W.	
Dofare	Aſia	Arabia	Indian Ocean	16 24 N.	53 40 E.	

St. Dominga

A Table of Latitudes and Longitudes.

Names of Places.	Cont.	Countries.	Coaſt.	Latitude.	Longitude.	H.Water.
				° ′	° ′	
S. Diomedis I.	Aſia	"	South Sea	63 00 N.	170 00 W.	
St. Dominga Hiſpaniola	Am.	Antilles	Atl. Ocean	18 25 N.	69 30 W.	
I. Dominico	Am.	Carribbee	Atl. Ocean	15 18 N.	61 28 W.	
Dordrecht	Eu.	D. Neth.	R. Meas.	52 00 N.	4 26 E.	
C. Dorſui	Africa.	Ajan	Indian Ocean	10 15 N.	50 44 E.	
C. Doro	Eu.	Turkey	Archipelago	38 02 N.	25 12 E.	
Dort	Eu.	D. Neth.	Germ. Ocean	51 47 N.	4 40 E.	3h. 0m.
I. Doſel	Eu.	Livonia	Baltic Sea	58 20 N.	23 00 E.	
Is. Dos Banhos	Africa.	Zanguebar	Indian Ocean	5 15 N.	49 24 E.	
Dover	Eu.	England	Eng. Channel	51 07 N.	1 19 E.	11 30
Downs	Eu.	England	Germ. Ocean	51 25 N.	1 27 E.	1 15
Po. Dradate	Africa	Egypt	Red Sea	19 56 N.	37 40 E.	
Po. Drake, ſir Francis	Am.	California	Pacif. Ocean	38 45 N.	128 35 W.	
Drontheim	Eu.	Norway	North Ocean	63 16 N.	10 55 E.	
Dublin	Eu.	Ireland	Iriſh Sea	53 12 N.	6 55 W.	9 15
Dunbar	Eu.	Scotland	Germ. Ocean	55 58 N.	2 22 W.	2 30
Dundalk	Eu.	Ireland	Iriſh Sea	53 57 N.	6 28 W.	
Dundee	Eu.	Scotland	Germ. Ocean	56 26 N.	2 48 W.	2 15
Dungarvan	Eu.	Ireland	Atl. Ocean	51 57 N.	7 55 W.	4 30
Dungeneſs	Eu.	England	Eng. Channel	50 53 N.	0 51 E.	9 45
Duncanſby Head	Eu.	Scotland	Germ. Ocean	58 40 N.	2 57 W.	
Dunkirk	Eu.	France	Germ. Ocean	51 02 N.	2 27 E.	0 00
Dunnoſe	Eu.	I. White	Eng. Channel	50 34 N.	1 15 W.	9 45
Durazzo	Eu.	Turky	Medit. Sea	41 58 N.	25 00 E.	
Cuſky Bay	Aſia	N. Zealand	Pacif. Ocean	45 47 S.	166 18 E.	10 57
E						
C. Eaſt	Am.	Statenland	Stra. le Maire	54 54 S.	64 47 W.	
Eaſter Iſle	Am.	Chili	Pacif. Ocean	27 8 S.	109 52 W.	2 00
Edinburgh	Eu.	Scotland	Germ. Ocean	55 58 N.	3 1 W.	4 30
Edyſton	Eu.	England	Eng. Channel	50 12 N.	4 20 W.	5 30
Egmont Iſle	Aſia	Society Iſles	Pacif. Ocean	19 20 S.	138 30 W.	
C. Egmont	Aſia	N. Zealand	Pacif. Ocean	39 20 S.	173 45 E.	
I. Elba	Eu.	Italy	Mediterran.	42 52 N.	10 38 E.	
R. Elbe mouth	Eu.	Germany	Germ. Ocean	54 18 N.	7 10 E.	0 00
Elbing	Eu.	Poland	Baltic Sea	54 12 N.	20 35 E.	
Elſingburgh	Eu.	Sweden	Baltic Sea	56 00 N	13 35 E.	
Elſinore	Eu.	Denmark	Baltic Sea	56 00 N	13 23 E.	
I. Elutheria N. pt. S. pt.	Am.	Bahama	Atl. Ocean	25 45 N. 24 57 N.	76 42 W. 75 53 W.	
Embden	Eu.	Germany	Germ. Ocean	53 05 N.	7 26 E.	0 00
R. Emes mouth	Eu.	Germany	Germ. Ocean	53 10 N	7 20 E.	7 30
Enchuyſen	Eu.	D. Neth.	Zudyer Sea	52 43 N.	5 06 E.	0 00
Endeavour R.	Aſia	N. Holland	Pacif. Ocean	15 26 S.	145 12 E.	
I. Engano, or Trompouſe	Am.	Sumatra	Indian Ocean	6 00 S.	102 35 E.	
B. Enhorn	Eu.	Greenland	North Sea	78 45 N	26 05 E.	
Epheſus	Aſia	Natolia	Archipelago	38 00 N.	27 53 E.	
Erramanga	Aſia	N. Hebrides	Pacif. Ocean	18 44 S.	169 20 E.	
Eſtaples	Eu.	France	Eng. Channel	50 34 N.	1 42 E.	11 00
Euſtatia	Am.	Caribbe	Atl. Ocean	17 30 N.	63 14 W.	
I. Exuma	Am.	Bahama	Atl. Ocean	23 25 N.	75 35 W	
F						
Fairhead	Eu.	Ireland	Weſt. Ocean	55 19 N.	6 20 W.	
C. Falcon	Africa	Barbary	Medit. Sea	36 03 N.	0 14 W.	
I. Falkland E. end Iſl. Anifant	Am.	Patagonia	Atl. Ocean	51 05 S. 52 27 S.	56 40 W. 61 53 W.	
Fglmouth	Eu.	England	Eng. Channel	50 12 N.	5 12 W.	5 30
C. Falo	Eu.	Turky	Archipelago	40 12 N.	24 27 E.	
C. Falſo	Africa	Caffers	Indian Ocean	34 16 S.	18 44 E.	
C. Falſo	Africa.	Zanguebar	Indian Ocean	8 52 S.	59 55 E	

Falſterbom

A Table of Latitudes and Longitudes.

Names of Places	Cont.	Countries.	Coaſt.	Latitude. ° '	Longitude. ° '	H. Water.
Falſterbom	Eu.	Sweden	Baltic Sea	55 20 N.	13 36 E.	
I. Fana	Eu.	Turky	Medit. Sea	40 14 N.	19 32 E.	
R. Farate'	Africa.	Egypt	Red Sea	21 40 N.	36 29 E.	
Faro Head	Eu.	Scotland	Weſt Ocean	58 40 N.	4 50 W.	
C. Farewell	Aſia	N. Zealand	Pacif. Ocean	40 35 S.	172 47 E.	
C. Farewell	Am.	Greenland	North Ocean	59 37 N.	44 30 W.	
C. Fartack	Aſia	Arabia	Indian Ocean	15 41 N.	51 31 E.	
C. Fehr	Am.	Carolina	Atl. Ocean	34 04 N.	78 09 W.	
I. Fernando Noronha	Am.	Braſil	Atl. Ocean	3 56 S.	32 23 W.	
I. Felicur, Lipari Iſles	Eu.	Italy	Medit. Sea	38 33 N.	14 51 E.	
I. Fermina	Eu.	Turky	Archipelago	37 24 N.	25 05 E.	
I. Fernandepo	Africa.	Guinea	Alt. Ocean	3 02 N.	3 33 E.	
I. Ferro	Africa.	Canaries	Atl. Ocean	27 48 N.	18 06 W.	
C. Finiſtere	Eu.	Spain	Atl. Ocean	42 57 N.	9 36 W.	
I. Fironda	Aſia	Corea	Pacif. Ocean	33 30 N.	127 25 E.	
Flamborough Head	Eu.	England	Germ. Ocean	54 08 N.	0 11	4h. 00m.
I. Flores	Eu.	Azores	Atl. Ocean	39 29 N.	30 59 W.	
C. Florida	Am.	Florida	G. Mexico	25 50 N.	80 20 W.	7 30
Fluſhing	Eu.	D. Neth.	Germ. Ocean	51 33 N.	3 20 E.	0 45
I. Fly	Eu.	D. Neth.	Germ Ocean	53 16 N.	5 35 E.	7 30
Forbiſher's Straits	Am.	Greenland	Atl. Ocean	62 50 N.	47 18 W.	
North Foreland	Eu.	England	Eng. Channel	51 28 N.	1 25 E.	9 45
North Foreland	Eu.	England	North Ocean	51 12 N.	1 24 E.	9 45
South Foreland	Eu.	England	Eng. Channel	51 25 N.	1 30 E.	10 30
South Foreland	Eu.	England	Eng. Channel	55 05 N.	6 30 E.	10 30
Foreland Fair	Eu.	Ireland	North Ocean	51 12 N.	1 30 W.	
Foreland Fair	Eu.	Greenland	North Ocean	79 18 N.	10 30 E.	
Foreland Merchants	Am.	Greenland	North Ocean	63 20 N.	17 05 W.	
I. Formentaria	Eu.	Spain	Medit. Sea	38 33 N.	1 15 E.	
I. Formigas	Eu.	Azores	Atl. Ocean	37 17 N.	24 43 W.	
C. Formoſa	Africa.	Guinea	Eth. Sea	4 22 N.	5 43 E.	
R. Formoſa	Africa.	Guinea	Eth. Sea	6 10 N.	4 49 E.	
I. Formoſa { N. pt. S. point	Aſia	China	Indian Ocean	21 25 N. 22 00 N.	121 25 E. 120 40 E.	
I. Forteventura S. W. end	Africa.	Canaries	Atl. Ocean	28 35 N.	14 04 W.	
Foulneſs	Eu.	England	Germ. Ocean	52 77 N.	0 58 E.	6 45
Foulſound	Eu.	Greenland	North ocean	77 30 N.	12 50 E.	
Fowey	Eu.	England	Eng. Channel	50 25 N.	4 30 W.	5 15
I. France, P. Louis	Africa	Madagaſcar	Indian ocean	20 10 S.	57 33 E	
C. St. Francis	Am.	Peru	Pacif. ocean	0 30 N.	80 35 W.	
I. St. Franciſco	Africa	Zanguebar	Indian Ocean	6 23 S.	53 22 E.	
R. St. Franciſco	Am.	Braſil	Atl. Ocean	10 55 S.	36 30 W.	
C. Francois	Am.	Domingo	Pacif. ocean	19 47 N.	72 15 W.	
Frederickſtat	Eu.	Norway	Sound	59 00 N.	11 10 E.	
French Keys	Am.	Bahama	Atl. Ocean	21 30 N.	72 10 W.	
Fretum Borough	Eu.	Ruſſia	North ocean	70 00 N.	61 20 E.	
Friendly I.	Aſia		South Sea	18 47 S.	174 30 W.	
C. Frio	Am.	Braſil	Atl. Ocean	23 00 S.	42 11 W.	
R. Fugor	Africa	Zanguebar	Indian ocean	00 10 N.	42 05 E.	
I. Fuego	Africa	De Verd	Atl. Ocean	14 55 N.	23 28 W.	
Furneaux Iſland	Aſia	Soc. Iſles	Pacif. ocean	17 11 S.	143 07 W.	
B. Fuſhan	Aſia	China	Pacif. ocean	23 00 N.	112 35 E.	
I. Fyal	Eu.	Azores	Atl. ocean	38 32 N.	28 33 W.	2 20
G.						
I. Galla	Am.	Terra Firma	Pacif. ocean	2 40 N.	79 35 W.	
R. Gallega	Am.	Patagonia	Atl. Ocean	51 37 S.	65 35 W.	
I. Gallego	Am.	Terra Firma	Pacif. ocean	1 40 N.	104 35 W.	
Gallipoli	Eu.	Italy	Medit. Sea	40 19 N.	18 08 E.	
Gallipoly	Eu.	Turkey	Archipelago	40 36 N.	27 02 E.	
I. Gallita	Africa	Barbary	Medit. Sea	37 42 N.	9 03 E.	
C. Gallo	Aſia	I. Ceylon	Indian ocean	6 15 N.	80 20 E.	

Gally

A Table of Latitudes and Longitudes,

Names of Places.	Cont.	Countries.	Coaſt,	Latitude.	Longitude.	H. Water.
				° ′	°	
I. Gallepago	Am.	Peru	Pacif. ocean	2 00 N. 2 00 S.	89 00 W.	
Gally Head	Eu.	Ireland	Weſt ocean	52 40 N.	9 30 W.	
Galway	Eu.	Ireland	Weſt ocean	53 10 N.	10 03 W.	
R. Gambia	Africa	Negroland	Atl. ocean	13 00 N.	14 58 W.	
I. Gamo	Aſia	India	Indian ocean	3 05 S.	77 25 E.	
C. Gardafui	Africa	Anian	Indian ocean	11 48 N.	50 25 E.	
R. Garronne	Eu.	France	B. Biſcay	45 30 N.	1 05 W.	3h 0m.
Gaſpey Bay	Am.	Acadia	G. St. Lawr.	48 49 N.	63 34 W.	1 30
C. de Gatt	Eu.	Spain	Medit. Sea	36 32 N.	2 05 W.	
C. Gear	Africa	Barbary	Atl. ocean	30 35 N.	10 01 W.	
Genoa	Eu.	Italy	Medit. Sea	44 25 N.	8 41 E.	
C. St. George	Am.	Newfound.	Atl. ocean	48 28 N.	57 43 W.	
C. George	Am.	St. Georgia	Atl. ocean	54 17 S.	36 33 W.	
B. St. George	Am.	Newfound.	Atl. ocean.	48 19 N.	57 30 W.	
I. St. George	Aſia	Natolia	Archipelago	38 47 N.	25 07 E.	
I. St. George	Eu.	Azores	Atl. ocean	38 39 N.	28 00 W.	
St. George's Fort	Aſia	India	B. Bengal	13 08 N.	80 39 E.	
Gibraltar	Eu.	Spain	Medit. Sea	36 05 N.	4 46 W.	0 00
Gilbert's Iſland	Am.	T. del. Fuego	Pacif. ocean	55 13 S.	71 4 W.	
I. Gilelo { N. point	Aſia	Spice Iſlands	Indian ocean	2 30 N.	128 00 E.	
S. point				1 30 S.	129 25 E.	
Glaſgow	Eu.	Scotland	R. Clyde	55 52 N.	4 05 W.	
Glouceſter Iſles	Aſia	Society Iſles	Pacif. ocean	19 11 S.	140 4 W.	
Glouceſter Iſles	Aſia	Society Iſles	Pacif. ocean	20 36 S.	146 7 W.	
Goa	Aſia	India	Malabar	15 31 N.	73 50 E.	
Goes	Eu.	D. Neth.	Germ. Ocean	51 39 N.	4 05 E.	
Golfe triſte	Am.	Terra Firma	Carrib. Sea	10 20 N.	67 40 W	
Gombroon	Aſia	Perſia	Perſian Gulf	20 40 N.	55 20 E.	
I. Gomero	Africa	Canaries	Atl. ocean	28 09 N.	17 07 W.	
C. Gondewar	Aſia	India	B. Bengal	16 55 N.	82 55 E.	
C. Good Hope	Africa	Caffers	Indian ocean	34 29 S.	18 23 E.	3 00
I. Gorea	Africa	Negroland	Atl. ocean	14 40 N.	17 20 W.	
I. Gorgona	Eu.	Italy	Medit. Sea	43 21 N.	9 11 E.	
Gothland { North end	Eu.	Sweden	Baltic Sea	58 00 N.	20 15 E.	
South end				56 58 N.	19 37 E.	
Wiſby				57 40 N.	19 50 E.	
I. Goto	Aſia	Corea	Pacif. Ocean	34 25 N.	125 50 E.	
Gottenberg	Eu.	Sweden	Sound	57 42 N.	11 44 E.	
Gottingen	Eu.	Germany	Inland	51 32 N.	9 58 E.	
Gower's Iſle	Aſia	N. Britain	Pacif. ocean	7 56 S.	158 56 E.	
R. Grand	Am.	Paraguy	Atl. ocean	31 58 S.	50 35 W.	
Granville	Eu.	France	Eng. Channel	48 50 N.	1 32 W.	7 00
C. De Grat	Am.	Newfound.	Atl. ocean	51 36 N.	55 33 W.	
I. Gratioſa	Africa	Canaries	Atl. ocean	29 15 N.	13 07 W.	
I. Gratioſa	Eu.	Azores	Atl. ocean	39 02 N.	27 58 W.	
C. Gratios a Dios	Am.	New Spain	Carribe Sea	14 48 N.	82 15 W.	
Graveline	Eu.	France	Eng. Channel	50 59 N.	2 13 E.	0 60
Graveſend	Eu.	England	R. Thames	51 35 N.	0 20 E.	1 30
I. Grenada	Am.	Carribae	Atl. ocean	11 52 N.	61 30 W.	
Greenwich	Eu.	England	R. Thames	51 29 N.	0 05 E.	
C. Gremia	Eu.	Turky	Archipelago	40 33 N.	26 20 E.	
Gripſwald	Eu.	Germany	Baltic Sea	54 04 N.	13 31 E.	
Grimeſby	Eu.	England	Germ. ocean	53 30 N.	0 56 E.	
Groin, or C. Corunna	Eu.	Spain	B. Biſcay	43 28 N.	9 20 W.	3 00
I. Groy	Am.	Newfound.	Atl. ocean	50 56 N.	55 35 W.	
I. Guadaloupe	Am.	Carribbe	Atl. ocean	16 20 N.	61 25 W.	
Guayaquil	Am.	Peru	Pacif. ocean	2 10 S.	80 10 W.	
I. Guernſey	Eu.	England	Eng. Channel	49 30 N.	2 47 W.	1 30
Gulf	Eu.	England	St. Geo. Ch.	50 06 N.	6 00 W.	
Gurjef	Aſia	Aſtracan	Caſpian Sea	47 7 N.	52 07 E.	

A Table of Latitudes and Longitudes.

Names of Places.	Cont.	Countries.	Coaſt·s	Latitude.	Longitude.	H. Water
H				° '	° '	
Halcluit's Headland	Eu.	Greenland	North Ocean	79 55 N.	12 00 E.	
I. Hainam N. E. point	Aſia	China	Indian Ocean	19 45 N.	110 13 E.	
I. Hainam S. W. point				18 22 N.	108 13 E.	
Halifax	Am.	Nova Scotia	Weſtern Oc.	44 40 N.	63 20 W.	7 30m
I. Hall	Am.	Greenland	Atl. Ocean	63 56 N.	44 26 W.	
Halliford	Eu.	Ireland	North Ocean	64 30 N.	27 15 W.	
Hamburgh	Eu.	Germany	R. Elbe	53 41 N.	10 38 E.	6 00
Hare Iſle	Am.	Canada	R. St. Lawr.	48 00 N.	63 26 W.	3 00
Harlem	Eu.	D. Neth.	Germ. Ocean	52 24 N.	4 10 E.	9 00
Hartland Point	Eu.	England	Briſtol Chan.	51 06 N.	4 35 W.	
Hartlepool	Eu.	England	Germ Ocean	54 40 N.	0 56 W.	3 00
Harwich	Eu.	England	Germ. Ocean	52 11 N.	1 18 E.	11 15
C. Harteras	Am.	Carolina	Atl. Ocean	35 24 N.	76 20 W.	
Havannah	Am.	I. Cuba	Atl. Ocean	23 12 N.	81 11 W.	
Havre de Grace	Eu.	France	Eng. Channel	49 30 N.	0 17 E.	9 00
Hawke's Bay	Aſia	N. Zealand	Pacif. Ocean	39 30 S.	177 6 E.	
I. St. Helena	Africa	Caffers	Atl. Ocean	15 55 S.	5 49 W.	
Helie's Sound	Eu.	Greenland	North Ocean	79 15 N.	12 50 E.	
Iſ. Heligh Land	Eu.	Norway	North Ocean	65 15 N.	9 30 E	
C. Henrietta Maria	Am.	New Wales	Hudſon's Bay	55 10 N.	84 00 W.	12 00
C. Henry	Am.	Virginia	Atl. Ocean	37 00 N.	76 23 W.	11 15
Hervey's Iſle	Aſia	Society Iſles	Pacif. ocean	19 17 S.	158 48 W.	
Harvy's Iſle	Aſia		South Sea	19 18 S.	158 54 W.	
I. Heys	Eu.	France	B. Biſcay	46 24 N.	2 14 W.	
High Mount	Eu.	Greenland	North ocean	83 23 N.	26 40 E.	
Hinchingbrook I.	Asia	N. Hebrides	Pacif. Ocean	17 25 S.	168 38 E.	
C. Henlopen	Am.	Maryland	Atl. Ocean	38 48 N.	75 03 W.	
Iſl. Hiſpaniola C. Tiberon, W. pt.	Am.	Antilles	Alt. Ocean	18 17 N.	74 24 W.	
St. Louis				18 19 N.	73 1 W.	
C. St. Nichol. N. W. pt.				19 50 N.	73 18 W.	
Po. Grave				18 28 N.	72 42 W.	
St. Domingo				18 25 N.	69 30 W.	
C. Raphael, N. E. pt.				19 05 N.	68 30 W.	
Hogſties	Am.	Bahama	Atl. Ocean	21 41 N.	73 25 W.	
New Holland W. limit	Asia	———	Indian Ocean	25 30 S.	111 10 E.	
N. Ditto				12 35 S.	141 31 E.	
S. Ditto				43 38 S.	146 00 E.	
E. Ditto				27 10 S.	153 39 E.	
Holy Cape	Asia	Siberia	North ocean	72 32 N.	179 45 E.	
Holy Head	Eu.	Wales	Iriſh Sea	53 23 N.	4 40 W.	1 30
C. Honduras	Am.	New Spain	Carribean Sea	16 18 N.	85 23 W.	
B. Hondy, I. Cuba	Am.	Antiles	Atl. Ocean	22 54 N.	82 40 W.	
Honfleur	Eu.	France	R. Seine	49 24 N.	0 20 E.	9 00
Hood's Iſl.	Asia	Marqueſas	Pacif. Ocean	9 26 S	138 52 W.	
Hope Iſle	Eu.	Greenland	North Ocean	76 22 N.	23 40 E.	
C. Horn	Am.	T. del Fuego	Pacif. ocean	55 59 S	67 26 W.	
Hornſound	Eu.	Greenland	North ocean	76 41 N.	13. 36 E.	
La Hogue	Eu.	France	Eng. Channel	49 45 N.	1 55 W.	
How's Iſle	Asia	Soc. Iſles	Pacif. ocean	16 46 S.	154 7 W.	
C. How	Asia	N. Holland	Pacif. ocean	37 24 S.	150 00 E.	
Hue-heini	Asia		South Sea	16 41 S	151 03 W.	
R. Houghly	Aſia	India	B. Bengal	21 45 N.	89 15 E.	
Hull	Eu.	England	R. Humber	53 50 N.	0 28 W.	6 00
R. Humber, Ent.	Eu.	England	Germ. Ocean	53 55 N.	0 24 E.	5 13
I. Hyneago	Am.	Bahama	Atl. Ocean	21 27 N.	73 29 W.	
I						
Jado	Asia	Japan	Pacif. ocean	36 00 N.	139 40 E.	
C. Jaffanapatan	Asia	I. Ceylon	Indian Ocean	9 47 N.	80 55 E.	
I. ~~Jago~~	Africa	C. Verd	Atl. Ocean	15 07 N.	23 30 W.	
Jakutſkoi	Asia	Siberia	Pacif. ocean	62 2 N.	129 52 E.	

A Table of Latitudes and Longitudes.

Names of Places.	Cont.	Countries.	Coaſt.	Latitude.	Longitude	H. Water.
				° ′	° ′	
I. Jam. Weſt end	Am.	Weſt Indies	Atl. Ocean	18 45 N.	78 00 W.	
I. Jam. Port Royal				17 40 N.	76 37 W.	
I. Jam. Eaſt end				17 58 N.	76 05 W.	
James Town	Am.	Virginia	B. Cheſapeak	37 30 N.	76 00 W.	
R. Janeiro	Am.	Braſil	Atl. Ocean	22 54 S.	42 40 W.	
Japan Iſles	Aſia		Pacif. Ocean	40 40 N.	141 25 E.	
				31 45 N.	126 10 E.	
Java I. C. Delo, W. pt.	Aſia	Sim	Indian Ocean	6 50 S.	105 15 E.	
Java I. Eaſt limit				7 00 S. 8 30 S.	115 55 E.	
Ice Cove	Am.	N. Main	Hudſ. Straits	62 20 N.	69 00 W.	10 00m.
Ice Point	Eu.	Nova Zem	North Ocean	77 40 N.	69 10 E.	
Ice Sound	Eu.	Greenland	North Ocean	78 13 N.	12 00 E.	
I. Jerſey	Eu.	England	Eng. Channel	49 07 N.	2 26 W.	
Jeruſalem	Aſia	Paleſtine	Inland	31 50 N.	35 20 E.	
I. Ilay, S. pt.	Eu.	Scotland	Weſt Ocean	55 39 N.	6 20 W.	
R. Indus	Aſia	India	Indian Ocean	25 50 N.	66 33 E.	
Inverneſs	Eu.	Scotland	Germ. Ocean	57 33 N.	4 02 W.	
I. Joanna	Africa	Zanguebar	Indian Ocean	12 05 S.	45 45 E.	
Jaddah	Aſia	Arabia	Red Sea	22 00 N.	39 27 E.	
C. St. John	Am.	Newfoundl.	Weſt ocean	50 08 N.	55 32 W.	
C. St. John	Africa	Maiumbo	Eth. Ocean	1 17 N.	9 34 E.	
Fort St. John	Am.	Newfoundl.	Atl. Ocean	47 34 N.	52 18 W.	6 00
I. St. John E. pt.	Am.	Canda	Bay St. Laurence	46 30 N.	62 03 W.	
I. St. John N. pt.				47 07 N.	64 05 W.	
I. St. John de Nova	Africa	Madagaſcar	Indian Ocean	17 00 S.	44 02 E.	
St. John de Luz	Eu.	France	B. Biſcay	43 10 N.	1 38 W.	3 30
Cape Jones	Am.	New Britain	Hudſon's Bay	58 50 N.	79 00 W.	
Joppa	Aſia	Syria	Levant	32 45 N.	36 00 E.	
Jones Sound	Am.	Groenland	Baffin's Bay	71 07 N.	91 30 W.	
St. Joſeph	Am.	California	Pacif. Ocean	23 3 S.	109 35 W.	
Ipſwich	Eu.	England	Germ. Ocean	52 14 N.	1 00 E.	
Iſpahan	Aſia	Perſia	R. Zenduro	32 25 N.	52 55 E.	
C. St. Juan	Am.	Satenland	Atl. Ocean	54 47 N.	63 47 W.	
I. Juan Fernandes	Am.	Chili	Pacif. Ocean	33 45 S.	78 37 W.	
Port St. Julian	Am.	Patagonia	S. Atl. Ocean	48 51 S.	65 10 W.	4 45
I. Ivica	Eu.	Spain	Medit. Sea	38 54 N.	1 15 E.	
K						
Kalmer	Eu.	Sweden	Baltic Sea	56 40 N.	17 25 E.	
Kambaya	Aſia	India	Indian Ocean	23 36 N.	72 50 E.	
Kamchatcha Lower	Aſia	Siberia	Pacif. Ocean	56 11 N.	159 25 E.	
Kamchatcha Upper				54 48 N.	157 25 E.	
Kamtkatka	Aſia		South Sea	56 45 N.	160 07 E.	
I. Caraghinſkoy	Aſia	Siberia	Pacif. Ocean	58 00 S.	162 10 E.	
I. St. Katherine's	Am.	Braſil	Atl. Ocean	27 45 N.	47 58 W.	
Keco	Aſia	Tonquin	Indian Ocean	21 55 N.	106 10 E.	
Kegor	Eu.	Muſcovy	North Ocean	70 18 N.	34 00 E.	
R. Kennebeck	Am.	New England	Atl. Ocean	44 00 N.	69 45 W.	
Kentiſh nock, a ſand	Eu.	England	Germ. Ocean	51 42 N.	1 45 E.	0 00
I. St. Kilda	Eu.	Scotland	Weſt ocean	57 44 N.	8 18 W.	
I. Kilduin	Eu.	Lapland	North Ocean	69 30 N.	31 20 E.	7 30
Kinſale	Eu.	Ireland	Atl. Ocean	51 32 N.	9 01 W.	
Klip	Eu.	Greenland	North Ocean	80 10 N.	12 22 E.	
R. Kola	Eu.	Lapland	North Ocean	68 53 N.	33 08 E.	
C. Kol	Eu.	Sweden	Sound	56 50 N.	13 13 E.	
Port Komol	Africa	Abyſſinia	Red Sea	22 30 N.	36 17 E.	
Komero Iſles	Africa	Zanguebar	Indian ocean	10 48 S.	44 46 E.	
				13 10 S.	46 22 E.	
R. Kowimia	Aſia	Siberia	North Ocean	70 40 N.	159 00 E.	

A Table of Latitudes and Longitudes;

Names of Places.	Cont.	Countries.	Coast.	Latitude.	Longitude.	H. Water.
L				° '	° '	
Ladrone, or Marian Iſles	Aſia	——	Pacif. ocean	21 00 N	144 00 E.	
				13 15 N	142 55 E.	
C. L'Aigulle	Africa	Caffraria	Indian ocean	34 50 S.	20 06 E.	
Lancaſter	Eu.	England	St. Geo. Ch.	54 42 N.	4 36 W.	
I. Lancerota	Africa	Canaries	Atl. Ocean	29 10 N.	13 20 W.	
Land's end	Eu.	England	St. Geo. Ch.	50 06 N	5 50 W.	7h. 30m.
Langeneſs	Eu.	Nova Zem.	N. Ocean	74 40 N.	53 36 E.	
I. Lambay	Eu.	Ireland	Iriſh Sea	53 24 N.	7 30 W.	8 15
I. Lampadoſa	Africa	Tunis	Medit. Sea	35 32 N.	12 45 E.	
St. Lawrance I.	Asia		South Sea	62 30 N.	178 00 W.	
B. St. Lazarus	Am.	Patagonia	Pacif. ocean	48 42 N.	73 35 W.	
C. Ledo	Africa	Angola	Atl. ocean	9 24 S.	12 55 E.	
Leith	Eu.	Scotland	Germ. Ocean	55 58 S.	2 59 W.	4 30
Leghorn	Eu.	Italy	Medit. Sea	43 33 N.	10 25 E.	
I. Lemnos	Aſia	Natolia	Archipelago	40 02 N.	25 36 E.	
C. Lengua	Eu.	Turkey	Medit. Sea	40 44 N.	19 36 E.	
Leoſtoff	Eu.	England	Germ Ocean	52 38 N.	1 54 E.	
Lepanto	Eu.	Turkey	Medit. Sea	38 20 N.	22 03 E.	9 45
Leper's Iſle	Asia	N. Hibrides	Pacif. Ocean	15 23 N.	167 57 E.	
I. Leſow	Eu.	Denmark	Sound	57 05 S.	11 06 E.	
Liverpool	Eu.	England	Iriſh Sea	53 22 N.	3 10 W.	11 15
I. Lewes, N. pt.	Eu.	Scotland	Weſt Ocean	58 35 N.	6 37 W.	6 30
Liampo, or Ningpo	Asia	China	Pacif. Ocean	30 00 N.	120 30 E.	
Lima	Am.	Peru	Pacif. Ocean	12 01 N.	76 50 W.	
Lime	Eu.	England	Eng. Channel	50 45 N.	3 15 W.	7 00
Limerick	Eu.	Ireland	R. Shanon	52 22 N.	10 00 W.	
I. Limoſa	Eu.	Italy	Medit. Sea	36 08 N.	13 01 E.	
I. Lipari	Eu.	Italy	Medit. Sea	38 35 N.	15 31 E.	
I. Liqueo	Aſia	Japan	Pacif. ocean	28 00 N.	127 30 E.	
Liſbon	Eu.	Portugal	R. Tagus	38 42 N.	9 4 W.	2 15
Liſbon Rock	Eu.	Portugal	Weſt Ocean	38 42 N.	9 25 W.	
C. Liſburne	Aſia	N. Hibrides	Pacif. ocean	15 41 N.	166 57 W.	
I. Liſſa	Eu.	Dalmatia	Adriatic Sea	42 56 S.	18 32 E.	
Lizard	Eu.	England	Eng. Channel	49 57 N.	5 21 W.	7 30
Iſles Loffout S. W. end	Eu.	Norway	North Ocean	68 15 N.	10 20 E.	
N. E. end				69 00 N.	12 00 E	
R. Loire, Ent.	Eu.	France	B. Biſcay	47 07 N.	2 05 W.	3 00
London	Eu.	England	R. Thames	51 32 N	0 00 W.	3 00
New London	Am.	N. England	Weſt Ocean	41 50 N.	72 14 W.	1 30
Londonderry	Eu.	Ireland	Weſt Ocean	55 01 N.	7 31 W.	
Long Iſle	Am.	N. England	Weſt Ocean	41 00 N.	71 59 W.	
					74 20 W.	3 00
I. Longo	Eu.	Dalmatia	Adriat. Sea	43 45 N.	17 58 E.	
Longſand Head	Eu.	England	Germ. Ocean	51 47 N.	1 41 E.	10 30
Lookout Point	Eu.	Greenland	North Ocean	76 40 N.	16 25 E.	
C. Lopas	Africa	Loango	Atl. Ocean	0 47 S.	8 30 E.	
B. St. Louis	Am.	Louſiana	G. Mexico	28 50 N	97 08 W.	
Louiſburg	Am.	C. Breton	B. St. Lawr.	45 54 N.	59 50 W.	
Lubec	Eu.	Germany	Baltic Sea	54 00 N.	11 40 E.	
C. St. Lucar	Am.	California	Pacif. ocean	23 15 N.	109 40 W.	
R. Lucia	Africa	Caffers	Indian ocean	27 52 S.	33 28 E.	
I. St. Lucia	Africa	Cape de Verd	Atl. Ocean	16 43 N.	24 33 W.	
I. St. Lucia	Am.	Carribbe	Atl. Ocean	13 45 N.	61 00 W.	
I. Luconia N. E. point	Aſia	Phil. Iſles	Pacif. ocean	19 25 N.	121 45 E.	
C. Bajador				18 50 N.	120 25 E.	
Manila				14 30 N.	120 25 E.	
S. W. point				13 30 N.	119 35 E.	
E. point				14 00 N.	124 00 E.	
Lunden	Eu.	Sweden	Baltic Sea	55 42 N.	13 21 E.	
I. Lundy	Eu.	England	St. Geo. Ch.	51 20 N.	4 04 W.	3 15

A Table of Latitudes and Longitudes.

Names of Places.	Cont.	Countries.	Coaſt.	Latitude.	Longitude.	H. Water.
				° '	° '	
Lupis's Head	Eu.	Ireland	Weſt ocean	52 24 N.	10 15 W.	
Lytan	Eu.	England	Germ. ocean	52 55 N.	0 32 E.	6 00
M						
C. Mabo	Aſia	New Guinea	Pacif. Ocean	0 40 S.	130 05 E.	
Macao, or Makau	Aſia	China	Pacif. ocean	22 13 N.	113 46 E.	
Macaſſar	Aſia	I. Celebes	Pacif. ocean	5 11 S.	117 30 E.	
C. Machian	Eu.	Spain	B. Biſcay	43 44 N.	3 05 W.	
I. Madagaſcar. C. St. Mary, S. point	Africa	———	Indian ocean	25 24 S.	45 53 E.	
B. St. Auguſtine				23 15 S.	44 25 E.	
Terra de Gada				19 36 S.	44 46 E.	
C. St. Andrew				15 46 S.	45 22 E.	
C. St. Sebaſtian				12 30 S.	49 13 E.	
C. de Ambre, N. point				12 15 S.	50 15 E.	
B. d'Antongil				16 00 S.	49 40 E.	
Antavare				20 53 S.	47 48 E.	
Po. Dauphin				24 48 S.	48 06 E.	
I. Madeira Funchal	Africa	Canaries	Atl. ocean	32 36 N.	17 06 W.	12h. 4m.
W. end				32 25 N.	17 21 W.	12 0
Madraſs	Aſia	India	Indian Ocean	13 8 N.	80 7 E.	
Madrid	Eu.	Spain	R. Manzana	40 25 N.	03 45 W.	
Madura	Aſia	India	Indian Ocean	10 15 N.	78 35 E.	
R. Maes mouth	Eu.	D. Neth	Germ. Ocean	52 06 N.	3 50 E.	1 30
Str. Le Maire	Am.	Patagonia	Atl. ocean	54 51 S.	65 00 W.	
Magadoxa	Africa	Zanguebar	Indian ocean	2 53 N.	45 25 E.	
Str. Magellan E. ent.	Am.	Patagonia	Atl. ocean	52 30 S.	68 10 W.	
W. ent.			Pacif. Ocean	52 50 S.	74 18 W.	
Magiſiſland	Aſia	India	Malabar Coaſt	12 10 N	74 14 E	
I. Maguana	Am.	Bahama I.	Atl. ocean	22 36 N.	72 25 W.	
P. Mahon, Iſle Minorca	Eu.	Spain	Medit. Sea	39 51 N	3 53 E.	
Majorca, Iſ. Majorca	Eu.	Spain	Medit. Sea	39 45 N.	2 25 E.	
C. Mala	Eu.	Turkey	Archipelago	37 20 N.	24 07 E.	
Malacca	Aſia	India	Str. Malacca	2 12 N.	102 10 E.	
Malaga	Eu.	Spain	Medit. Sea	36 43 N.	4 02 W.	
Iſles Maldive N. end.	Aſia	India	Indian ocean	7 20 N.	73 03 E.	
S. end.				0 20 S.	76 10 E.	
Maldeſtram Whirlpool	Eu.	Norway	Weſt Ocean	68 08 N.	10 40 E.	
I. Malique	Aſia	Maldive I.	Indian ocean	7 45 N.	72 40 E.	
St. Maloes	Eu.	France	Eng. Channel	49 39 N.	1 57 W.	6 00
I. Malta	Eu.	Italy	Medit. Sea	35 54 N.	14 28 E.	
I. Man, W. end.	Eu.	England	Iriſh Sea	53 45 N.	5 00 W.	9 00
Mangalor	Aſia	India	Indian ocean	13 02 N.	75 10 E.	
Manila	Aſia	I. Luconia	Pacif. Ocean	14 30 N.	120 25 E.	
I. Mansfield, N. pt.	Am.	New Britain	Hudſon's Bay	62 38 N.	80 33 W.	
I. Manfia	Africa	Zanguebar	Indian Ocean	8 36 S.	40 40 E.	
I. Mardou	Eu.	Norway	Sound	58 14 N.	8 55 E.	
I. Margarita	Am.	Terra Firma	Atl. ocean	11 15 N.	63 35 W.	
R. Maragnon	Am.	Braſil	Atl. ocean	1 48 S.	44 17 W.	
Margate	Eu.	England	Eng. Channel	51 29 N.	1 10 E.	11 15
C. St. Maria	Eu.	Portugal	Atl. ocean	36 45 N.	7 45 W.	
C. St. Maria, or Lucia	Eu.	Italy	Medit. Sea	40 04 N.	18 31 E.	
Marian, or Laſtrone Iſles N. lim.	Aſia	———	Pacif. ocean	21 00 N.	114 00 E.	
S. lim.				13 [illegible] N.	142 55 E.	
I. S. Maries	Eu.	Azores	Atl. ocean	37 00 N.	25 00 W.	
St. Maries	Eu.	I. Scilly	Eng. Channel	49 57 N.	6 45 W.	

I. Marigallante

A Table of Latitudes and Longitudes.

Names of Places.	Cont.	Countries.	Coaſt.	Latitude.	Longitude.	H. Water.
				° ′	° ′	
I Marigallante	Am.	Weſt Indies	Atl. Ocean	16 00 N.	61 10 W.	
I. Maritimo, Sicily	Eu.	Italy	Medit. Sea	38 04 N.	12 03 E.	
Marqueſa Iſ.	Aſia		Pacif. ocean	9 56 S.	139 00 W.	2h. 30m.
C. Martelo	Eu.	Turkey	Medit. Sea	38 00 N.	26 00 E.	
St. Martha	Am.	Terra Firma	Atl. Ocean	11 26 N.	74 06 W.	
I. St. Martin	Am.	Weſt Indies	Atl. Ocean	18 06 N.	63 06 W.	
C. St. Martin	Africa	Caffers	Atl. Ocean	32 08 S.	18 58 E.	
C. St. Martin	Eu.	Spain	Medit. Sea	38 44 N.	0 25 E.	
I. Martinique, Po. Royal	Am.	Weſt Indies	Atl. Ocean	14 36 N.	61 02 W.	
Marſeilles	Eu.	France	Medit. Sea	43 18 N.	5 21 E.	
C. St. Mary	Am.	Newfound.	Atl. ocean	46 52 N.	54 01 W.	
C. St. Mary	Am.	Braſil	Atl. ocean	34 52 S.	52 55 W.	
C. St. Mary	Aſia	Natolia	Archipelago	37 46 N.	27 21 E	
C. St. Mary	Eu.	Spain	N. Atl. ocean	36 46 N.	7 49 W.	
C. Virgin Mary	Am.	Patagonia	S. Atl. ocean	52 23 S.	68 10 W.	
Maſafuero	Am.	Chili	Pacif. ocean	33 45 S.	80 34 W.	
I. Maſcarenhas	Africa	Zanguebar	Indian Ocean	20 52 S.	55 35 E.	
I. Macarin	Am.	Peru	Pacif. Ocean	1 20 S.	88 50 W.	
Maſcat	Aſia	Arabia	Indian Ocean	23 10 N.	57 40 E	
Maſkelyne's Iſles	Aſia	N. Hebrides	Pacif. Ocean	16 32 S.	167 59 E.	
Maſterland	Eu.	Sweden	Sound	57 58 N.	12 00 E.	
Maſulipatan	Aſia	India	B. Bengal	16 28 N.	81 40 E.	
C. Matapan	Eu.	Turkey	Archipelago	30 25 N.	22 40 E.	
I. Matbare	Aſia	Japan	Pacif. ocean	26 30 N.	137 00 E.	
I. St. Mathew's	Africa	Guinea	Eth. Ocean	1 23 S.	6 11 W.	
St. Matthew's I.	Aſia		South Sea	60 40 S.	177 30 E.	
I. Mauritius	Africa	Madagaſcar	Indian Ocean	20 10 S.	57 33 E.	
Maurua	Aſia	Society Iſles	Pacific Ocean	16 26 S.	152 33 W.	
I. May	Africa	C. Verd	Atl. Ocean	15 13 N.	23 04 W.	
C. May	Am.	Penſilvania	Atl. Ocean	39 15 S	74 43 W.	
I. Mayette	Africa	Madagaſcar	Indian Ocean	12 53 N.	46 10 E.	
Mecca	Aſia	Arabia	Red Sea	21 40 N.	41 00 E.	
Medina	Aſia	Arabia	Red Sea	24 58 N.	39 53 E.	
I. Melada	Eu.	Dalmatia	Adriat Sea	42 40 N.	19 34 E.	
Melinde	Africa	Zanguebar	Indian Ocean	3 07 S.	39 40 E.	
I. Melo	Eu.	Turkey	Archipelago	36 41 N.	25 05 E.	
Memel	Eu.	Courland	Baltic Sea	55 48 N.	22 23 E.	
Memitſan	Eu.	France	B. Biſcay	44 20 N.	1 23 W.	3 30
I. Menado	Aſia	I. Celebes	Pacif. Ocean	1 36 N.	122 25 E.	
C. Mendozin	Am.	California	Pacif. Ocean	41 20 N.	130 15 W.	
Mercury Bay	Aſia	N. Zealand	Pacif. Ocean	36 50 S.	175 12 E.	
R. Meraparvous	Am.	Bahama	Atl. Ocean	21 58 N.	74 13 W.	
Meſſina	Eu.	I. Sicily	Medit. Sea	38 21 N.	16 21 E.	
C. Meſurato	Africa	Tripoli	Medit. Sea	32 18 N.	16 36 E.	
I. Metylene — C. Sigre	Aſia	Natolia	Archipelago	39 21 N.	26 08 E.	
Metylene				39 11 N.	26 47 E.	
Po. Oliviea				39 00 N.	26 50 E.	
I. Meun	Eu.	Denmark	Baltic Sea	55 00 N.	13 15 E	
Mexico	Am.	Mexico	Inland	19 54 N.	100 05 W.	
Miatea	Aſia	Society Iſles	Pacif. Ocean	17 52 S.	148 6 W.	
I. St. Michael	Eu.	Azores	Atl. Ocean	37 45 N.	25 23 W.	
Middlebourg	Eu.	D. Neth	Germ. Ocean	51 37 N.	3 58 E.	
Middleburg, or Eaoowe	Aſia	Friendly Iſles	Pacif. Ocean	21 21 S.	174 34 W.	
Milford	Eu.	Wales	St. Geo. Ch.	51 45 N.	5 15 W.	5 15
Milo, I. Milo	Aſia	Turkey	Archipelago	36 41 N.	25 05 E.	
Mill Iſles	Am.	North Main	Hudſon's Bay	64 36 N.	80 30 W.	

A Table of Latitudes and Longitudes.

Names of Places.	Cont.	Countries.	Coaſt.	Latitude.	Longitude.	H. Water.
				° ′	° ′	
I. Mindanao N. point	Aſia	Spice Iſlands	Pacif. Ocean	9 40 N.	124 25 E.	
I. Mindanao S. E. pt. C. St. Auguſtine				6 40 N.	126 25 E.	
I. Mindanao S. W. pt. Caldera				7 00 N.	121 25 E.	
I. Mindanao S. point				3 50 N.	124 43 E.	
I. Mindora	Aſia	Philip. Iſles	Pacif. Ocean	13 00 N.	119 37 E.	
I. Minorca N. W. pt.	Eu.	Spain	Mediterran.	39 58 N.	3 54 E.	
I. Minorca S. E. pt.				40 24 N.	4 18 E.	
G. Miquelon	Am	Newfoundl.	Atl. Ocean	47 3 N.	56 13 W.	
L. Miquelon	Am.	Newfound.	Atl. Ocean	46 50 N.	56 13 W.	
I. Miſco	Am.	Nova Scotia	G. St. Lawr.	48 04 N.	64 19 W.	
C. Miſerata	Africa.	Guinea	Atl. Ocean	6 25 N.	9 35 W.	
R. Miſſiſſipi, mouth	Am.	Louſiana	G. Mexico	29 00 N.	89 17 W.	
Mizen Head	Eu.	Ireland	Atl. Ocean	51 16 N.	10 20 W.	
Mocha	Aſia	Arabia	Red Sea	13 45 N.	44 04 E.	
Modon	Eu.	Turkey	Medit. Sea	36 55 N.	21 03 E.	
I. Mohilla	Africa	Zanguebar	Indian Ocean	11 55 S.	45 00 E.	
I. Monſerat	Am.	Weſt Indies	Atl. Ocean	16 48 N.	62 22 W.	
Montague Iſle	Aſia	N. Hebrides	Pacif. Ocean	17 26 S.	168 31 E.	
Montreal	Am.	Canada	R. St. Lawr.	45 52 N.	73 11 W.	
I. Monte Chriſto	Eu.	Italy	Medit. Sea	42 17 N.	10 28 E.	
C. Monte Sancto	Eu.	Turkey	Archipelago	40 27 N.	24 39 E.	
Monument	Aſia	N. Hebrides	Pacif. Ocean	17 14 S.	168 38 E.	
Mount St. Michael	Eu.	France	Eng. Channel	48 39 N.	1 35 W.	
I. Morgo	Aſia	Natolia	Archipelago	36 55 N.	26 30 E.	
Morlaix	Eu.	France	Eng. Channel	48 30 N.	3 50 W.	
Mort Point	Eu.	England	St. Geo. Ch.	51 12 N.	4 40 W.	
Moſambique	Africa	Zanguebar	Indian Ocean	15 00 S.	41 40 E.	
Moſcow	Eu.	Ruſſia	R. Moſcow	55 25 N.	37 51 E.	
Moſquitos Bank	Am.	Mexico	Atl. Ocean	14 45 N.	80 05 W.	
C. Mount	Africa	Guinea	Atl. Ocean	7 12 N.	10 44 W.	
Mount's Bay	Eu.	England	Eng. Channel	50 05 N.	5 45 W.	4h. 30m.
Mouſe River	Am.	New Wales	Hudſon's Bay	51 25 N.	83 15 W.	
C. Muſaldon	Aſia.	Arabia	Perſian Gulf	26 04 N.	55 22 E.	
N						
C. Nabo	Aſia	Japan	Pacif. Ocean	40 35 N.	141 25 E.	
Nangaſack	Aſia	Japan	Pacif. Ocean	32 45 N.	128 50 E.	
Nankin	Aſia	China	Pacif. Ocean	32 07 N.	118 35 E.	
Nantes	Eu.	France	B Biſcay	47 13 N.	1 29 W.	3 00
Nantucket Iſle	Am.	New England	Weſt ocean	41 34 N.	69 40 W.	
Naples	Eu.	Italy	Medit. Sea	40 51 N.	14 19 E	
Narbonne	Eu.	France	Medit. Sea	43 11 N.	3 05 E.	
Narſinga	Aſia	India	B. Bengal	18 05 N.	85 20 E.	
Narva	Eu.	Livonia	G. Finland	59 08 N.	29 18 E.	
I. Naſſau	Aſia	Sumatra	Indian Ocean	3 00 S.	100 25 E.	
C. Naſſau	Am.	Terra Firma	Atl. Ocean	7 53 N.	58 07 W.	
Naſſau Str.	Eu.	Ruſſia	North Ocean	69 55 N.	57 30 E	
B. Natal	Africa	Caffers	Indian Ocean	29 25 S.	33 10 E.	
I. Naxos	Eu.	Turkey	Archipelago	37 06 N.	25 58 E.	
Naze	Eu.	Norway	Weſt Ocean	57 50 N.	7 32 E.	11 15
Needles	Eu.	England	Eng. Channel	50 41 N.	1 28 W.	10 15
C. Negrilles	Aſia	Pegu	B. Bengal	16 20 N.	94 15 E.	
C. Negro	Africa	Caffers	Atl. Ocean	16 30 S.	11 30 E.	
C. Negro	Africa	Barbary	Medit. Sea	37 17 N	9 09 E.	
Negropont	Eu.	Turkey	Archipelago	38 30 N.	24 05 E.	
Port Nelſon	Am.	New Wales	Hudſon's Bay	57 07 N.	92 37 W.	
Port Nelſon's Shoals	Am.	New Wales	Hudſon's Bay	57 35 N.	92 07 W.	8 20
I. Nevis	Am.	Caribbe Iſles	Atl. ocean	17 11 N.	62 52 W.	
Newcaſtle	Eu.	England	Germ. Ocean	55 03 N.	1 28 W.	3 15
R. Nicaragua	Am.	New Spain	Atl. ocean	11 40 N.	82 47 W.	

A Table of Latitudes and Longitudes.

Names of Places.	Cont.	Countries.	Coaſt.	Latitude.	Longitude.	H. Water.
				° '	° '	
Nice	Eu.	Italy	Medit. Sea	43 42 N.	7 22 E.	
Iſ. Nicobar	Aſia	Siam	B. Bengal	7 22 N	94 40 E.	
I. St. Nicholas	Africa.	C. Verd I.	Atl. Ocean	16 35 N.	24 06 W.	
St. Nicholas I.	Aſia		South Sea	63 45 N.	173 0 W.	
Nicotera	Eu.	Italy	Medit. Sea	38 33 N.	16 30 E.	
Nieuport	Eu.	Flanders	Germ. Ocean	51 08 N.	2 50 E.	12h. 0m.
Ninhay	Aſia	China	Pacif. Ocean	37 10 N	122 25 E.	
Ningpo, or Liampo	Aſia	China	Pacif. Ocean	30 00 N.	120 50 E.	
I Nio	Eu.	Turkey	Archipelago	36 48 N.	26 02 E.	
I. Noel	Aſia	India	Indian Ocean	10 30 S	105 25 E.	
C. Noir	Am.	T. del Fuego	Pacif. Ocean	54 32 S.	72 3 W.	
Norfolk Iſle	Aſia	N. Holland	Pacif. Ocean	29 2 S.	168 10 E.	
C. de Non	Africa.	Barbary	Atl. Ocean	28 04 N	10 32 W.	
Nombre de Dios	Am.	Terra Firma	Carribbe Sea	9 43 N.	78 35 W.	
Nore	Eu.	England	R. Thames	51 28 N.	0 48 E.	0 00
Noriton	Am.	Penſylvania	Inland	40 10 N.	75 77 W.	
C. North	Am.	Terra Firma	Atl. Ocean	1 45 N.	49 00 W.	
C. North	Am.	C. Breton	Atl. Ocean	47 5 N.	60 8 W.	
C. North	Am.	St. Georgia	Atl. Ocean	54 5 S.	38 15 W	
N. Cape, I. Maggoroe	Eu.	Lepland	North Ocean	71 10 N.	25 55 E.	3 00
North Point	Eu.	Norway	North Ocean	62 15 N.	6 15 E.	
North Bluff	Am.	North Main	Hudſ. Straits	62 30 N.	70 59 W.	
I. Nottingham, E. pt.	Am.	New Britain	Hudſ. Straits	63 35 N.	77 48 W.	3 00
O						
Oaite-Peha Bay	Aſia	Etahite	Pacif. Ocean	17 46 S.	149 13 W.	
Oczakow	Eu.	Turkey	Black Sea	45 12 N.	34 40 E.	
I. Oeland { S. end N. end	Eu.	Sweden	Baltic Sea	{ 56 15 N 57 23 N.	18 35 E. 17 36 E.	
Ohamaneno	Aſia	Society Iſles	Uliatea	16 46 S.	151 38 W.	11 20
Old Head of Kingſale	Eu.	Ireland	Atl. Ocean	51 30 N.	8 54 W.	
I. Oleron	Eu.	France	B. Biſcay	45 51 N.	1 25 W.	
Olinde	Am.	Braſil	S. Atl. Ocean	8 13 S.	35 05 W	
Olivia	Eu.	Germany	Baltic Sea	54 20 N.	18 30 E.	
Ollone	Eu.	France	B. Biſcay	46 32 N.	1 36 W.	3 45
Onegelia	Eu.	Italy	Medit. Sea	43 57 N.	7 52 E.	
Oporto	Eu.	Portugal	Atl. Ocean	40 53 N.	8 35 W.	
Oran	Africa	Barbary	Medit. Sea	35 45 N.	0 00	
C. Orange	Am.	Terra Firma	Atl. ocean	4 27 N.	50 50 W.	
Obritello	Eu.	Italy	Medit. Sea	42 30 N.	12 00 E.	
I. Orchillo	Am.	Terra Firma	Carribean Sea	11 32 N.	65 25 W.	
Orenburg	Aſia	Aſtracan	Inland	51 46 N.	55 14 E.	
Orfordneſs	Eu.	England	Germ. Ocean	52 17 N.	1 11 E.	9 45
Orkney Iſles, limits	Eu.	Scotland	Weſt Ocean	{ 59 24 N. 58 44 N.	3 23 W. 2 11 W.	 3 00
New Orleans	Am.	Louſiana	R. Miſſiſſipi	30 00 N	90 00 W.	
I. Ormus	Aſia	Perſia	G. Perſia	27 30 N.	55 17 E.	
C. del Oro, or Olerada	Africa.	Negro-land	Atl. ocean	23 30 N.	14 31 W.	
R. Oronoque	Am.	Terra Firma	Atl. ocean	8 08 N.	59 50 W.	
C. Oropeſo	Eu.	Spain	Medit. Sea	40 20 N.	0 49 E.	
Orſk	Aſia	Aſtracan	Inland	51 12 N.	58 32 E.	
C. Ortegal	Eu.	Spain	B. Biſcay	43 47 N.	8 32 W.	
Ortona	Eu.	Italy	Medit. Sea	42 19 N.	14 37 E.	
I. Oruba	Am.	Terra Firma	Caribbean Sea	12 03 N.	69 03 W.	
Oſnaburg Iſle	Aſia	Society Iſles	Pacif. Ocean	22 00 S.	141 34 W.	
Oſtend	Eu.	Flanders	Germ. Ocean	51 14 N.	3 00 E.	12 00
C. Otranto	Eu.	Italy	Medit. Sea	40 23 N.	17 41 E.	
Owharre Bay	Aſia	Huahine	Pacif. Ocean	16 44 S.	151 8 W.	
Owhy-hie	Aſia	Japan	Pacif. Ocean	22 0 N.	169 10 W.	
Ozaca	Aſia		South Sea	35 10 N.	134 05 E.	
P						
C. Padron	Africa	Congo	Atl. ocean	6 00 S.	11 40 E.	

Paita

A Table of Latitudes and Longitudes.

Names of Places.	Cont.	Countries.	Coaſt.	Latitude.	Longitude.	H. Water.
				° ′	° ′	
Paita	Am.	Peru	Pacif. Ocean	5 20 S.	80 35 W.	
C. Paillouri	Eu.	Turkey	Archipelago	29 59 N.	24 03 E.	
Palermo, I. Sicily	Eu.	Italy	Medit. Sea	28 10 N.	13 43 E.	
Paliakate	Aſia	India	B. Bengal	13 40 N.	80 50 E.	
Palliſer's Iſle	Aſia	Society Iſles	Pacif. Ocean	15 38 S.	146 30 W.	
C. Palliſer	Aſia.	N. Zealand	Pacif. Ocean	41 40 S.	175 28 E.	
I. Palma	Africa	Canaries	Atl. Ocean	28 36 N.	18 00 W.	
I. Palmaria	Eu.	Italy	Medit. Sea	41 00 N.	13 03 E.	
Palmerſton's Iſle	Aſia.	Society Iſles	Pacif. Ocean	18 00 S.	162 57 W.	
C. Palmirds	Aſia.	India	B. Bengal	20 40 N.	87 35 E.	
C. Palmas	Africa	Guinea	Atl. Ocean	4 26 N.	5 56 W.	
Panama	Am.	Mexico	Pacif. Ocean	8 45 N.	79 59 W.	
I. Panaria	Eu.	Italy	Medit. Sea	38 40 N.	15 41 E.	
Panorma	Eu.	Turky	South Sea	40 05 N.	21 40 E.	
I. Pantalaria	Eu.	Italy	Medit. Sea	36 55 N.	12 31 E.	
R. Panuco	Am.	Mexico	G. Mexico	24 02 N.	100 13 W.	
R. Parabia	Am.	Braſil	Atl. Ocean	21 26 S.	39 50 W.	
Paris	Eu.	France	R. Siene	48 50 N.	2 25 E.	
C. Paſſero	Eu.	I. Sicily	Medit. Sea	36 35 N.	15 22 E.	
C. Patam	Aſia.	Malacca	Indian Ocean	7 27 N.	101 28 E.	
I. Patmos	Aſia.	Natolia	Archipelago	37 22 N.	26 48 E.	
R. Pattahan	Aſia.	I. Sumatra	Str. Malacca	0 28 N.	102 25 E.	
C. Paul	Eu.	Spain	Medit. Sea	37 50 N.	0 15 W.	
I. St. Paul	Am.	Newfound.	B. St. Lawr.	47 12 N.	59 59 W.	
I. St. Paul	Aſia	Madagaſcar	Indian Ocean	38 20 S.	75 25 E.	
Port St. Peter and St. Paul	Aſia.		South Sea	53 27 N.	158 30 E.	
St. Paul de Leon	Eu.	France	Eng. Channel	48 41 N.	3 55 W.	4h. 00m.
I. Paxeros	Am.	California	Pacif. Ocean	30 18 N.	120 45 W.	
I. Pearl or Serana	Am.	Weſt Indies	Atl. ocean	14 55 N.	79 00 W.	
Pegu	Aſia.	India	B. Bengal	17 00 N.	96 58 E.	
Pekin	Aſia.	China	Inland	39 55 N.	116 22 E.	
I. Pelugoſa	Eu.	Italy	Adriat. Sea	42 20 N.	18 32 E.	
I. Pemba	Afric.	Zanguebar	Indian Ocean	5 38 S	40 09 E.	
C. Pembroke	Am.	New Wales	Hudſon's Bay	63 12 N.	82 54 W.	
I. Pengwin	Am.	Newfound.	Atl. Ocean	47 23 N.	56 56 W.	
Penmark	Eu.	France	B. Biſcay	47 50 N.	4 20 W.	
R. Penobſcot	Am.	New England	Atl. Ocean	44 40 N.	68 52 W.	
Pernambuco	Am.	Braſil	S. Atl. Ocean	8 30 S.	35 07 W.	
Petapoli	Aſia	India	B. Bengal	16 14 N.	81 10 E.	
I. St. Peter	Am.	Newfound.	Atl. Ocean	46 46 N.	56 5 W.	
Peterſburg	Eu.	Ruſſia	Baltic Sea	59 56 N.	30 19 E.	
C. Petra	Aſia	Natolia	Archipelago	37 02 N.	27 38 E.	
Peveral Point	Eu.	England	Eng. Channel	50 34 N.	1 22 W.	
Philadelphia	Am.	Penſilvania	R. Delawar	39 57 N.	75 18 W.	
St. Philip	Africa	Benguela	Atl. Ocean	12 22 S.	13 20 E.	
I. Pianoſa	Eu.	Italy	Medit. Sea	42 46 N.	10 34 E.	
Iſle of Pines	Aſia	N. Caledonia	Pacif. Ocean	22 38 S.	167 38 E.	
I. Pico (Pike)	Eu.	Azores	Atl. Ocean	38 29 N.	28 19 W.	
C. Pinas	Eu.	Spain	B. Biſcay	43 51 N.	6 14 W.	
Pickerſgil's I.	Am.	S. Georgia	Atl. Ocean	54 42 S.	36 58 W.	
Mo. Pintados, or St. Martin	Am.	California	Pacif. Ocean	27 30 N.	117 15 W.	
Piſcadore Iſles	Aſia	China	Pacif. Ocean	23 30 N	119 25 E.	
Pitcairn's Iſles	Am.	Chili	Pacif. Ocean	25 2 S.	133 21 W.	
Placentia	Am.	Newfoundl.	Atl. Ocean	47 15 N.	53 43 W.	9 00
R. Plata	Am.	La Plata	Atl. Ocean	36 00 S.	57 40 W.	
R. Platwrack	Am.	Bahama Iſles	Atl. Ocean	20 04 N.	68 37 W.	
Plymouth	Eu.	England	Eng. Channel	50 24 N.	4 15 W.	6 00
Policaſtro	Eu.	Italy	Medit. Sea	40 18 N.	15 45 E.	
Is. Polſapate	Aſia	Cambaya	Indian Ocean	0 45 N.	100 55 E.	

I. Poma

A Table of Latitudes and Longitudes.

Names of Places.	Cont.	Countries.	Coaſt.	Latitude.	Longitude.	H. Water.
				° ′	° ′	
I. Poma	Eu.	Dalmatia	Adriat. Sea	42 57 N.	18 14 E.	
Pondicherry	Aſia	India	B. Bengal	11 56 N.	79 53 E.	
Ponrorſon	Eu.	France	Eng. Channel	48 33 N.	1 27 W.	
Ponoi	Eu.	Lapland	North Sea	68 52 N.	33 8 E.	
I. Ponza	Eu.	Italy	Medit. Sea	40 53 N.	13 09 E.	
Pool	Eu.	England	Eng. Channel	51 00 N.	1 50 W.	
Porto Port	Eu.	Portugal	Atl. ocean	40 53 N.	8 35 W.	
Port Mahon	Eu.	Spain	Medit. Sea	39 51 N.	3 53 E.	
Portland	Eu.	England	Eng. Channel	50 30 N.	2 48 W.	8 15m.
Port l'Orient	Eu.	France	B. Biſcay	47 47 N.	3 13 W.	
Porto Bello	Am.	New Spain	Carrib. Sea	9 33 N.	79 45 W.	
Porto Praya	Africa	C. Verd	Atl. Ocean	14 54 N.	23 29 W.	11 00
I. Porto Rico } E. point	Am.	Antiles	Atl. Ocean	18 35 N.	65 58 W.	
Port Rico				18 29 N	66 35 W.	
W. point				18 34 N.	67 51 W.	
I. Porto ſancto	Africa	Canaries	Atl. Ocean	32 58 N.	16 25 W.	
Portſal	Eu.	France	Eng. Channel	48 36 N.	4 43 W.	
Portſmouth. R. Acad.	Eu.	England	Eng. Channel	50 48 N.	1 01 W.	11 15
Praken	Aſia	Coch. Chi.	Indian Ocean	17 15 N.	106 15 E.	
Prenau	Eu.	Livonia	Baltic Sea	58 26 N.	24 58 E.	
I. Princes	Africa	Guinea	Atl. Ocean	1 47 N.	6 39 E.	
C. Prior	Eu.	Spain	Atl. Ocean	43 29 N.	8 15 W.	
I. Providence	Am.	Bahama	Atl. Ocean	24 51 N.	77 01 W.	
I. Providence, or St. Catharine	Am.	Mexico	Atl. Ocean	13 26 N.	80 42 W.	
Pudyoua	Aſia	N. Caledonia	Pacif. Ocean	20 18 S.	164 41 E.	6 00
I. Puli condor	Aſia	Cambaya	Indian Ocean	8 34 N.	107 35 E.	
Q						
Quaqua, or Ivory Coaſt	Africa	Guinea	Eth. Sea	5 00 N.	4 00 W.	
Quebeck	Am.	Canada	R. St. Lawr.	46 55 N	71 12 W.	7 30
Queda	Aſia	Malaya	B. Bengal	6 15 N.	100 12 E.	
I. Quelpert	Aſia	Korea	Pacif. ocean	33 32 N.	128 04 E.	
Quiloa	Africa	Zanguebar	Indian Ocean	9 30 S.	39 09 E.	
Quimper	Eu.	France	B. Biſcay	48 00 N.	4 06 W	
Quinam	Aſia	Coch. Chi.	Indian Ocean	12 52 N.	109 10 E.	
Quiraba Iſles	Africa	Zanguebar	Indian Ocean	11 00 N	41 39 E.	
C. Quiros	Aſia	N. Hebrides	Pacif. Ocean	14 56 S.	167 20 W.	
Quito	Am.	Peru	Inland	0 13 S.	77 56 W.	
R						
C. Race	Am.	Newfound.	Atl. Ocean	46 40 N.	52 38 W.	
Raguſa	Eu.	Dalmatia	Medit. Sea	42 45 N	20 00 E.	
Rajapour	Aſia	India	Indian Ocean	17 19 N.	73 50 E.	
Ramſgate	Eu.	England	Downs	51 20 N.	1 22 E.	
Ramhead	Eu.	England	Eng. Channel	50 17 N.	4 21 W.	
C. Raſalgate	Aſia	Arabia	Indian Ocean	22 46 N.	58 48 E.	
Ravenna	Eu.	Italy	Medit. Sea	44 26 N.	12 21 E.	
C. Ray	Am.	Newfound.	Atl. Ocean	47 37 N.	59 8 W.	
I. Rhee	Eu.	France	B. Biſcay	46 08 N	1 28 W.	3 00
Regio	Eu.	Italy	Mediterran.	38 22 N.	16 37 E.	
Cape Reſolution	Am.	N. Main	Hudſ. Straits	61 29 N.	65 10 W.	
Reſolution Bay	Asia	Marqueſas	Pacif. Ocean	9 55 S.	139 9 W.	
Reſolution Iſland	Aſia	Society Iſles	Pacif. Ocean	17 23 S.	141 45 W.	
Revel	Eu.	Livonia	Baltic Sea	59 22 N	25 33 E.	
Rhodes Iſle { Rhodes, N. end	Asia	Natolia	Archipelago	36 27 N.	28 36 E	
C. Tranquil, S. End				35 55 N.	28 23 E.	
Riga	Eu.	Livonia	Baltic Sea	56 55 N.	24 51 E.	
Ripraps, a ſand	Eu.	England	Straits Dover	51 53 N.	1 25 E.	
Robin Hood's Bay	Eu.	England	Germ. Ocean	54 25 N.	0 08 W.	3 00
I. Rocca	Am.	Terra Firma	Atl. Ocean	11 21 N.	66 17 W	

A Table of Latitudes and Longitudes.

Names of Places.	Cont.	Countries.	Coaſt.	Latitude.	Longitude.	H. Water.
				° '	° '	
Rochefort	Eu.	France	B. Biſcay	46 00 N.	1 00 W.	4h. 15m.
Rochel	Eu.	France	B. Biſcay	46 10 N.	1 9 W.	3 45
Rocheſter	Eu.	England	R. Medway	51 26 N.	0 30 E.	0 45
I. Rodrigue	Aſia	Madagaſcar	Indian Ocean	19 41 S.	63 45 E.	
C. Romain	Am.	Terra Firma	Atl. Ocean	11 40 N.	69 05 W.	
Rome	Eu.	Italy	Medit. Sea	41 54 N.	12 32 E.	
I. Roncadore	Am.	Mexico	Atl. Ocean	13 30 N.	78 53 W.	
Rood Bay	Eu.	Greenland	North Ocean	79 53 N.	14 00 E.	
C. Roque	Am.	Braſil	Atl. Ocean	5 00 S.	35 43 W.	
I Roquepis	Africa	Madagaſcar	Indian Ocean	9 52 S.	64 30 E.	
G. Roſes	Eu.	Spain	Medit. Sea	42 10 N.	3 18 E.	
Roſtock	Eu.	Germany	Baltic Sea	54 10 N.	12 50 E.	
I. Rotterdam	Aſia	Friendly Iſ.	Pacific Ocean	20 16 S.	174 30 W	
Rotterdam	Eu.	D. Neth	Germ. Ocean	51 56 N.	4 55 E.	3 00
Rouen	Eu.	France,	R. Seine	49 27 N.	1 10 E.	1 15
C. Roxant	Eu.	Portugal	Atl. Ocean	38 42 N.	9 35 W.	
C. Roxo	Africa	Negroland	Atl. Ocean	11 42 N.	14 33 W.	
Po. Royal	Am.	I. Jamaica	Caribbean Sea	17 40 N.	76 37 W.	
C. Rozier	Am.	Nova Scotia	G. St. Lawr.	48 55 N.	63 36 W.	
I. Rugen	Eu.	Germany	Baltic Sea	54 32 N.	14 30 E.	
I Rum Key, or Samana	Am.	Bahama	Atl. Ocean	23 00 N.	74 20 W	
R. Rupert	Am.	New Britain	Hudſon's Bay	51 45 N.	78 40 W	
C. Ruſato	Africa	Barca	Medit. Sea	32 53 N.	20 41 E.	
Ruſt Iſles	Eu.	Norway	N. Sea	67 40 N.	10 25 E.	
Rye	Eu.	England	Eng. Channel	51 03 N.	0 45 E	11 15
S.						
C. Sable	Am.	Nova Scotia	Atl. Ocean	43 24 N.	65 25 W.	
I. Sable, W. end	Am.	Nova Scotia	Atl. Ocean	44 09 N.	60 29 W.	
I. Saddle back	Am.	North Main	Hudſon's Str.	62 07 N.	68 13 W.	10 00
Saffia	Africa	Barbary	Atl. Ocean	32 30 N.	8 50 W.	
I. Safanjal bahr.	Africa	Egypt.	Red Sea	27 05 N.	34 40 E.	
B. Saldanna	Africa	Caffers	Atl. ocean	32 35 S.	19 30 E.	
I. Sal	Africa	C. Verd	Atl. ocean	16 55 N.	21 41 W.	
Salerno	Eu.	Italy	Medit. Sea	40 39 N.	14 48 E.	
I. Salini, Lipari Iſl.	Eu.	Italy	Medit. Sea	38 39 N.	15 24 E.	
I. Saliſbury	Am.	N. Main	Hudſon's Bay	63 29 N.	76 47 W.	
Sallee	Africa	Barbary	Atl. ocean	33 58 N.	6 20 W.	
Salomon Iſles	Aſia		Pacif. ocean	5 50 S. 11 15 S.	171 05 W. 178 35 W.	
Salonechi	Eu.	Turkey	Archipelago	40 41 N.	23 13 E.	
I. Salvages	Africa	Canaries	N. Atl. ocean	30 00 N.	15 49 W.	
I. Salvages Upper	Am.	N. Main	Hudſon's Str.	61 48 N.	66 20 W.	9 00
Lower				62 32½ N	70 48½ W.	11 30
I. Samos	Aſia	Natolia	Archipelago	37 46 N.	27 13 E.	
C. Sambrough	Am.	Nova Scotia	Weſtern Oc.	44 33 N.	63 20 W.	
St. Samuel I.	Aſia		South Sea	62 20 N.	173 00 W.	
Sandwich	Eu.	England	Downs	51 20 N	1 20 E	11 30
Sandwich Iſles	Aſia	N. Hebrides	Pacif. Ocean	17 41 S	168 33 E.	
Sandwich I.	Aſia		South Sea	21 44 N.	161 00 W.	
Sandwich Sound	Aſia		South Sea	59 20 N.	145 00 W.	
Sandwich Harbour	Aſia	Malicola	Pacif. Ocean	16 25 S.	167 53 E.	
Sandwich's Bay	Am.	St. Georgia	Atl. ocean	54 45 S.	36 4 W.	
I. Sanguin	Aſia	Philip. Iſles	Pacif. Ocean	3 50 N.	122 30 E.	
I. Sanien	Eu.	Norway	North Ocean	69 30 N.	14 30 E.	
Santa Cruz	Africa	Barbary	Atl. ocean	30 30 N.	9 35 W.	
I. Sardinia N. limit	Eu.	Italy	Medit. Sea	41 15 N.	9 31 E.	
S. pt. C. Tavolaro				38 54 N.	9 15 E	
Cagliari				39 25 N.	9 38 E.	
Oriſtagni				39 53 N.	9 01 E.	

A Table of Latitudes and Longitudes.

Names of Places.	Cont.	Countries.	Coaſt.	Latitude.	Longitude.	H. Water.
				° '	° '	
Sarena	Am.	Chili	Pacif. Ocean	29 40 S.	71 15 W.	
Saunder's Iſle	Am.	Sandwich l.	Atl. ocean	58 00 S.	26 58 W	
C. Saunders	Am.	St. Georgia	Atl. ocean	54 6 S.	36 58 W.	
Scanderoon	Aſia.	Syria	Levant	36 35 N.	36 25 E.	
Scarborough head	Eu.	England	Germ. Ocean	54 18 N.	00 00	3h. 45m.
I. Scarpanto	Aſia	Natolia	Archipelago	35 45 N.	27 40 E.	
I. Scatarie, N. E. pt.	Am.	Acadia	Weſt ocean	46 01 N.	61 57 W.	
Scaw	Eu.	Denmark	Sound	57 34 N.	10 54 E.	
I. Schelling	Eu.	D. Neth.	Germ. ocean	53 27 N.	5 30 E.	
I. Scio { C. S. Nicholas	Aſia.	Natolia	Archipelago	38 38 N.	26 12 E.	
Scio				38 24 N.	26 29 E.	
C. Blanco				38 08 N.	26 20 E.	
Scilly Iſles	Eu.	England	S. George ch.	50 00 N.	6 45 W.	3 45
Scots Settlement,	Am.	Terra Firma	Caribbean Sea	8 45 N.	76 35 W.	
I. Sea	Eu.	Turkey	Archipelago	37 38 N.	24 53 E.	
Seames	Eu.	France	B. Biſcay	48 00 N.	4 51 W.	
I. Sebaldes	Am.	Patagonia	Atl. Ocean	50 53 S.	59 35 W.	
C. Sebaſtian	Am.	California	Pacif. Ocean	43 00 N.	126 00 W.	
C. St. Sebaſtian	Africa	Madagaſcar	Indian Ocean	12 30 S.	49 13 E.	
St. Sebaſtian	Eu.	Spain	B. Biſcay	43 16 N.	2 05 W.	
Port Segura	Am.	Braſil	Atl. ocean	16 57 S.	39 45 W.	
R. Senegal	Afric.	Negroland	Atl. ocean	15 40 N.	16 20 W.	10 30
I. Seranilha	Am.	Weſt Indies	Atl. ocean	16 20 N.	79 40 W.	
I. Serigo	Eu.	Turkey	Archipelago	36 09 N.	23 24 E.	
I. Sertes	Africa	Canaries	Atl. Ocean	32 35 N.	16 20 W.	
R. Seſtos	Africa	Guinea	Atl. Ocean	5 48 N.	8 13 W.	
Seven Capes	Africa	Barbary	Medit. Sea	37 30 N.	6 15 W.	
Seven Stones, or Iſles	Eu.	England	St. Geo. Ch.	50 10 N.	6 40 W.	4 30
R. Severn, Ent.	Eu.	England	St. Geo. Ch.	51 41 N.	3 05 W.	6 00
R. Severn,	Am.	New Wales	Hudſon's Bay	56 12 N.	88 57 W.	
R. Seyn, Ent.	Eu.	France	Eng. Channel	49 36 N.	0 30 E.	9 00
Seynhead	Eu.	France	Eng. Channel	49 44 N.	0 34 E.	
Sheerneſs	Eu.	England	R. Thames	51 25 N.	0 50 E.	0 00
Shepherd's Iſles	Aſia	N. Hebrides	Pacif. ocean	17 00 S	168 42 E.	
Siam	Aſia.	India	Bay Siam	14 18 N	100 55 E.	
R. Siam, Ent.	Aſia.	India	Bay Siam	13 15 N.	100 47 E.	
Siara	Am.	Braſil	Atl. Ocean	3 18 S.	39 50 W.	
Iſ. Sicily { E. end, Meſſina	Eu.	Italy	Medit. Sea	38 10 N.	15 58 E.	
Catanea				37 22 N.	15 21 E.	
Syracuſe				37 04 N.	15 31 E	
S. end, C. Paſſaro				36 35 N.	15 22 E.	
Alicata				37 11 N.	14 07 E.	
W. end, C. Boco				37 51 N.	21 43 E.	
Palermo				38 10 N.	13 43 E.	
Sierra Leona	Africa	Guinea	Atl. ocean	8 30 N.	12 07 W.	8 15
Sillabar Road	Aſia.	I. Sumatera	Indian Ocean	4 00 S.	102 50 E.	
Str. Sincapore	Aſia.	Malacca	Indian ocean	1 00 N.	104 30 E.	
R. Sinda, or Indus, mouth	Aſia.	India	Indian ocean	24 30 N. 25 45 N	63 10 E. 62 40 E.	
Po. Shabak	Africa	Abyſſinia	Red Sea	18 58 N.	38 24 E.	
Shark, or Seahorſe point	Am.	N. Wales	Hudſon's Bay	64 05 N.	82 12 W.	
Shields	Eu.	England	Germ. Ocean	55 02 N.	1 20 W.	
Shelvock's Iſle	Am.	California	Pacif. Ocean	23 15 N.	117 35 W.	
Shillocks	Eu.	Ireland	Weſt Ocean	51 30 N.	11 05 W.	5 00
I. Shetland, limits	Eu.	Scotland	Weſt. Ocean	60 47 N. 59 54 N.	0 10 W. 1 31 W	3 00
Shoreham	Eu.	England	Eng. Channel	50 55 N.	00 77 E.	10 30
I. Sky { N. point	Eu.	Scotland	Weſt. Ocean	57 50 N.	6 30 W.	
S. point				57 15 N.	6 16 W.	5 30

A Table of Latitudes and Longitudes.

Names of Places.	Cont.	Countries.	Coaſt.	Latitude.	Longitude.	H. Water.
				° ′	° ′	
Sleepers Iſles	Am.	New Britain	Hudſon's Bay	60 00 N. 58 35 N.	81 30 W.	
Great Sleeper				60 19 N.	82 00 W.	
The Sleepers lie in a chain from the Great Sleeper down to Lat. 58° 50′ N. & Long. 82° 20′ W.						
Sline Head	Eu.	Ireland	Weſt Ocean	53 20 N.	2 15 W.	
R. Slude	Am.	New Britain	Hudſon's Bay	53 24 N.	78 50 W.	
Sluyce	Eu.	D. Neth.	Germ. Ocean	51 19 N.	3 50 E.	
C. Smith	Am.	Libradore	Hudſon's Bay	60 48 N	80 55 W.	
Smyrna	Aſia	Natolia	Archipelago	38 28 N.	27 25 E.	
I. Socatora	Africa	Anian	Indian Ocean	12 15 N.	52 55 E	
C. Solomon	Eu.	I. Candia	Medit. Sea	34 57 N.	27 06 E.	
R. Somme	Eu.	France	Eng. Channel	50 18 N.	1 40 E.	11h. 00m.
Sound Royal	Eu.	Iceland	North Ocean	66 22 N.	15 15 W.	
Southampton	Eu.	England	Eng. Channel	50 55 N.	1 00 W.	0. 00
C. Southampton	Am.	New Wales	Hudſon's Bay	61 54 N.	86 14 W.	
South Cape	Aſia	Diemen's la.	Pacif. Ocean	42 40 S.	130 05 E.	
C. Spartivento	Eu.	Italy	Medit. Sea	37 50 N.	16 41 E.	
C. Spartel	Africa	Barbary	Atl. Ocean	35 46 N.	5 53 W	
Stavenger	Eu.	Norway	Weſt Ocean	58 47 N.	6 45 E.	
C. Stephens	Aſia	N. Zealand	Pacif. Ocean	40 36 S.	174 05 E.	
I. Spirito Sancto	Am.	Braſil	Atl. Ocean	20 24 S.	39 55 W.	
Spurn	Eu.	England	Germ. Ocean	53 35 N.	0 30 E.	5 15
I. Stampalia	Aſia	Natolia	Archipelago	36 25 N.	26 55 E.	
I. Stancho	Aſia	Natolia	Archipelago	36 50 N.	27 30 E.	
Start Point	Eu.	England	Eng. Channel	52 09 N	3 42 W.	6 45
I. States C. St. John	Am.	Patagonia	Atl. Ocean	54 45 S.	60 35 W.	
C. St. Bartholomew				55 08 S.	60 45 W	
Stetin	Eu.	Germany	Baltic Sea	53 36 N.	15 25 E.	
C. Stillo	Eu.	Italy	Medit. Sea	38 23 N.	17 07 E.	
Port Steven	Am.	Chili	Pacif. Ocean	46 50 S.	82 36 W.	
Stockholm	Eu.	Sweden	Baltic Sea	59 22 N.	18 12 E.	
Stockton	Eu.	England	Germ. Ocean	54 33 N.	1 15 W.	5 15
Straelſund	Eu.	Germany	Baltic Sea	54 23 N.	14 10 E.	
Strangford Bay	Eu.	Ireland	Iriſh Sea	54 23 N.	5 40 W.	10 30
I. Stromboli	Eu.	Italy	Medit. Sea	38 42 N.	15 48 E.	
Succeſs Bay	Am.	T. del Fuego	Atl. Ocean	54 50 S.	65 25 W.	
Suez Town	Africa	Egypt	Red Sea	29 50 N.	33 27 E.	
Sukadana	Aſia	I. Borneo	Indian Ocean	1 00 S.	110 40 E.	
I. Sumatra NW. end	Aſia	India	Indian Ocean	5 15 N.	95 55 E.	
SE. end				5 07 S.	106 20 E.	
Sunderland	Eu.	England	Germ. Ocean	54 55 N	1 00 W.	3 30
Str. Sunda	Aſia	Siam	Indian Ocean	6 10 S.	105 35 E.	
Surinam	Am.	Terra Firma	Atl. Ocean	6 30 N.	55 30 W.	
Surat	Aſia	India	Indian ocean	21 10 N.	72 25 E.	
I. Suroy	Eu.	Lapland	North Ocean	71 00 N.	22 00 E.	
Swaken	Africa	Abyſſinia	Red Sea	19 30 N.	37 38 E.	
Swally Road	Aſia	India	Arabian Sea	21 55 N.	72 00 E.	
Swanſea	Eu.	Wales	St. Geo. Ch.	51 40 N.	4 25 W.	
Sweetnoſe	Eu.	Lapland	North Ocean	68 08 N.	34 43 E.	
Swin a ſand	Eu.	England	Ent. Thames	51 37 N.	1 12 E.	12 00
Syracuſe	Eu.	I. Sicily	Medit. Sea	37 04 N.	15 20 E.	
Syriam	Aſia	Pegu	B. Bengal	16 00 N.	96 40 E.	
T						
Tadouſac Fort	Am.	Canada	R. St. Lawr.	48 0 N.	67 35 W.	
I. Tamarica	Am.	Braſil	Atl. Ocean	7 56 S.	35 05 W.	

Tamarin

A Table of Latitudes and Longitudes.

Names of Places.	Cont.	Countries.	Coaſts.	Latitude.	Longitude.	H.Water
				° '	° '	
Tamarin Town	Africa	I. Socotra	Indian Ocean	12 30 N.	53 14 E.	9 00m
B. Tanaſſarin	Aſia	Malacca	B. Bengal	12 00 N.	98 48 E.	
I. Tandoxima	Aſia	Japan	Pacif. Ocean	30 30 N.	130 40 E.	
Tangier	Africa	Barbary	Atl. Ocean	35 55 N.	5 45 W.	
Tanna	Aſia	N. Hebrides	Pacif. Ocean	19 32 S.	169 45 E.	3 00
Taoukaa	Aſia	Society Iſles	Pacif. Ocean	14 31 S.	145 10 W.	
Tarento	Eu.	Italy	Medit. Sea	40 43 N.	17 31 E.	
C. Tat'nam	Am.	New Wales	Hudſon's Bay	57 35 N.	91 30 W.	
R. Tees, mouth	Eu.	England	Germ. Ocean	54 36 N.	0 52 W.	3 00
Tegoantepec	Am.	Mexico	Pacif. Ocean	14 45 N.	96 23 W.	
Tellichery	Aſia	India	Malabar Coaſt	11 42 N.	75 30 E.	
C. Telling	Eu.	Ireland	Weſt Ocean	54 40 N.	10 07 W.	
I. Tenedos	Aſia	Natolia	Archipelago	39 57 N.	26 14 E.	
I. Teneriff	Africa.	Canaries	Atl. Ocean	28 16 N.	16 32 W.	3 00
C. Tenes	Africa.	Barbary	Medit. Sea	36 26 N.	1 53 E.	
I. Tercere	Eu.	Azores	Atl. Ocean	38 45 N.	27 04 W.	
Terra Nieva	Am.	North Main	Hudſ. Straits	62 4 N.	67 2 W.	9 50
Tervere	Eu.	D. Neth	Germ. Ocean	51 38 N.	3 35 E.	0 45
Tetuan	Africa	Barbary	Medit. Sea	35 27 N.	4 50 W.	
I. Texel	Eu.	D. Neth.	Germ. Ocean	53 10 N.	4 59 E	7 30
C. St. Thadæus	Aſia	Siberia	North Ocean	62 10 N.	175 05 E.	
R. Thames mouth	Eu.	England	Germ. Ocean	51 28 N.	1 10 E.	1 30
C. St. Thomas	Africa	Caffers	Atl. Ocean	24 54 S.	15 25 E.	
I. St. Thomas	Africa	Guinea	Atl. Ocean	00 00	1 00 E.	
St. Thomas	Aſia	India	B. Bengal	13 00 N.	80 00 E.	
C. Three Points	Am.	Terra Firma	Atl. Ocean	10 51 N.	62 41 W.	
C. Three Points	Africa	Guinea	Atl. Ocean	4 48 N.	1 21 W.	
South Thule	Am.	Sandwich	Atl. Ocean	59 34 S.	27 45 W.	
I. Tidore	Aſia	Malocca Is.	Indian Ocean	0 35 N.	126 40 E.	
I. Timore { N. E. pt. S. W. pt.	Aſia	Molucca	Indian Ocean	{ 8 20 S. 10 10 S.	127 40 E. 123 55 E.	
Tinmouth	Eu.	England	Germ. Ocean	55 03 N.	1 17 W.	3 00
I. Tino	Eu.	Turkey	Archipelago	37 33 N.	25 43 E.	
I. Tobago	Am.	Caribbe	Atl. Ocean	11 15 N.	60 27 W.	
Tobolſki	Aſia	Siberia	Inland	58 12 N.	68 20 E.	
B. Todos Sanctos	Am.	Braſil	Atl. Ocean	13 05 S.	38 45 W.	
Tonquin	Aſia	India	Pacif. Ocean	20 50 N.	105 55 E.	
Tunſberg	Eu.	Norway	Sound	58 50 N.	10 05 E.	
Topſham	Eu.	England	Eng. Channel	50 37 N.	3 27 W.	6 00
Torbay	Eu.	England	Eng. Channel	50 34 N.	3 36 W.	5 15
Tornea	Eu.	Sweden	G. Bothnia	65 51 N.	24 16 E.	
R. Tortoſa	Eu.	Spain	Medit. Sea	40 47 N.	1 03 E.	
I. Tonola	Am.	Antil. Iſle	Atl. ocean	18 24 N.	65 00 W.	
I. Tory	Eu.	Ireland	Weſtern Oc.	55 09 N.	8 30 W.	5 30
Toulon	Eu.	France	Medit. Sea	43 07 N.	6 00 E.	
C. Trefalga	Eu.	Spain	Atl. ocean	36 08 N.	5 58 W.	
I. Tremiti	Eu.	Italy	Medit. Sea	42 09 N.	15 40 E.	
C. de Tres forcas	Africa	Barbary	Medit. Sea	35 30 N.	2 11 W.	
I. Trailles	Aſia	India	Indian Ocean	19 30 S.	101 25 E.	
I. Trinity	Am.	Braſil	Atl. Ocean	20 25 S.	23 35 W.	
I. Triniada, E. pt.	Am.	Terra Firma	Atl. Ocean	10 38 N.	60 27 W.	
Trinity Bay, Ent.	Am.	Newfoundl.	Atl. Ocean	48 30 N.	52 35 W.	
Trieſt	Eu.	Carniola	Adriat. Sea	45 51 N.	14 03 E.	
Trinquemali	Aſia	I. Ceylon	Indian Ocean	8 50 N.	83 24 E.	
Tripoli	Aſia	Syria	Levant	34 53 N.	36 07 E.	
Tripoly	Africa	Barbary	Medit. Sea	32 54 N.	13 10 E.	
G. Triſte	Am.	Terra Firma	Atl. Ocean	10 19 N.	67 41 W.	
I. Triſtian d'Acunha	Africa	Caffers	S. Atl. Ocean	37 12 S.	13 23 W.	
Iſ. Tromſound	Eu.	Lapland	North Ocean	70 20 N.	19 00 E.	
Truxilla	Am.	Peru	Pacif. ocean	8 00 S.	78 05 W.	
Tunder	Eu.	Denmark	Weſt. Ocean	55 00 N.	9 35 E.	

A Table of Latitudes and Longitudes.

Names of Places.	Cont.	Countries.	Coaſt.	Latitude.	Longitude.	H. Water
				° ′	° ′	
Tunis	Africa.	Barbary	Medit. Sea	36 47 N.	10 16 E.	
Turin	Eu.	Italy	R. Po	45 05 N.	7 43 E.	
I. Turks	Am.	Bahama	Atl. ocean	21 18 N.	71 05 W.	
Turtle Iſland	Aſia	———	Pacif. Ocean	19 49 S.	177 57 W.	
Turtle Iſland	Aſia		South Sea	2 2 N.	152 00 W.	
Tuſki Noſs Straits between Aſia and America				65 00 N.	171 00 W.	
V						
Valencia	Eu.	Spain	Medit. Sea	39 30 N.	0 40 W.	
St. Valery	Eu.	France	Eng. Channel	50 10 N.	0 56 E.	10h.30m.
Valona	Eu.	Turkey	Medit. Sea	40 55 N.	21 15 E.	
Valparifo	Am.	Chili	Pacif. Ocean	33 00 S.	72 14 W.	
Van Dieman's land	Aſia.	N. Holland	Indian Ocean	43 38 S.	146 27 E.	
Vannes	Eu.	France	B. Biſcay	47 39 N.	2 41 W.	3 45
C. Vela	Am.	Terra Firma	Atl. Ocean	12 15 N.	71 20 W.	
P. Venus	Aſia	Otaheite	Pacif. ocean	17 29 S.	149 36 W.	10 38
Venice	Eu.	Italy	Medit. Sea	45 27 N.	12 24 E.	
Vera Crus	Am.	New Spain	G. Mexico	19 00 N.	97 53 W.	
C. Verd	Africa	Negroland	Atl. Ocean	14 47 N.	17 28 W.	
Uhma	Eu.	Sweden	G. Bothnia	63 45 N.	21 10 E.	
Vicegapatam	Aſia	India	B. Bengal	17 30 N.	84 02 E.	
C. Victory	Am	Patagonia	Pacif. ocean	52 15 S.	74 28 W.	
Vienna	Eu.	Germany	R. Danube	48 11 N.	16 28 E.	
Vigo	Eu.	Spain	Atl. ocean	42 00 N.	8 35 W.	
B. St. Vincent	Am.	Paraguay	Atl. Ocean	23 55 S.	45 11 W.	
C. St. Vincent	Eu.	Portugal	Atl. Ocean	37 0 N.	8 58 W.	
I. St. Vincent	Africa	C. Verd	Atl. Ocean	17 47 N.	24 44 W.	
I. St. Vincent	Am.	Caribbee	Atl. Ocean	13 05 N.	61 05 W.	
R. St. Vincent	Africa	Guinea	Eth. Ocean	4 50 N.	7 41 W.	
C. Virgin Mary	Am.	Patagonia	Atl. Ocean	52 23 S.	68 10 W.	
I. Virgins	Am.	Antil. Iſle	Atl. Ocean	18 18 N.	64 14 W.	
Virgin Rocks	Am.	Newfound.	Atl. Ocean	46 30 N.	51 30 W.	
Ulitea	Aſia		South Sea	16 45 S.	151 25 W.	
Umba	Eu.	Ruſſia	Inland	66 40 N.	34 15 E.	
C. Volo	Eu.	Turky	Archipelago	39 07 N.	23 23 E.	
R. Voltas	Africa	Guinea	Atl. ocean	5 52 N.	1 10 E.	
C. Voltas	Africa	Caffers	Atl. Ocean	28 04 S.	16 18 E.	
Upſal	Eu.	Sweden	R. Sala	59 52 N.	17 43 E.	
Uraniberg	Eu.	Denmark	Baltic Sea	55 54 N.	12 52 E.	
I. Uſhant	Eu.	France	Eng. Channel	48 30 N.	5 15 W.	4 30
I. Uſtica	Eu.	Italy	Medit. Sea	38 43 N.	13 33 E.	
I. Vulcano	Eu.	Italy	Medit. Sea	38 29 N.	15 33 E.	
W						
Prin. Wales's Iſle	Aſia	N. Guinea	Endeavour Str.	10 26 S.	141 00 E.	
R. Wager	Am.	New Wales	Hudſon's Bay	65 28 N.	87 25 W.	6 00
Wallis's Iſle	Aſia	———	Pacif. Ocean	13 18 S.	176 20 W.	
C. Walſingham	Am.	New Britain	Hudſ. Straits	62 39 N.	77 48 W.	12 00
Wardhus	Eu.	Lapland	North Ocean	70 35 N.	32 45 E.	
Warſaw	Eu.	Poland	R. Viſtula	52 14 N.	21 10 E.	
Waterford	Eu.	Ireland	St. Geo. Ch.	52 07 N.	7 42 W.	6 30
Watling Iſle	Am.	Bahama	Atl. Ocean	23 42 N.	74 22 W.	
Wells	En.	England	Germ. Ocean	53 07 N.	1 00 E.	6 00
Weſtern Iſles	Aſia	Diemen's la.	Pacif. Ocean	43 36 S.	147 00 E.	
Weſtern Iſles S. point	Eu.	Scotland	Weſt. Ocean	56 46 N.	7 40 W.	
Weſtern Iſles N. point				58 35 N.	6 37 W.	
I. Weſtmania	Eu.	Iceland	Weſt. Ocean	63 55 N.	17 30 W.	
I. Weſtrol	Eu.	Lapland	North ocean	69 15 N.	24 00 E.	
Wexford	Eu.	Ireland	St. Geo. Ch.	52 13 N.	6 56 W.	
Weymouth	Eu.	England	Eng. Channel	52 40 N.	2 34 W.	7 20

Whale's

A Table of Latitudes and Longitudes.

Names of Places.	Cont.	Countries.	Coaſt.	Latitude.	Longitude.	H. Water.
				° ′	° ′	
Whale's Back	Eu.	Iceland	Weſt ocean	63 44 N.	17 05 W.	
Whale's Head	Eu.	Greenland	North Ocean	77 18 N.	21 30 E.	
Whale Rock	Eu.	Azores	Atl. Ocean	38 50 N.	24 41 W.	
Whitby	Eu.	England	Germ. Ocean	54 30 N.	0 50 W.	3h. 00m.
Whitehaven	Eu.	England	Iriſh Sea	54 25 N.	3 15 W.	
Whitſuntide I.	Aſia	N. Hebrides	Pacif. Ocean	16 44 S.	168 20 E.	
Wicklow	Eu.	Ireland	St. Geo. Ch.	52 50 N.	6 30 W.	
Willis's Iſle	Am.	St. Georgia	Atl. Ocean	54 00 S	38 30 W.	
Windaw	Eu.	Courland	Baltic Sea	57 08 N.	22 20 E.	
I. Wight N. end	Eu.	England	Eng. Channel	50 47 N.	1 11 W.	
I. Wight S. end				50 34 N.	1 10 W.	
I. Wight E. end				50 41 N.	1 00 W.	0 00
I. Wight W. end				50 41 N.	1 23 W.	
Iſ. Prince William	Aſia		Pacif. Ocean	16 45 S.	177 55 E.	
William Henry I.	Aſia	Society Iſles	Pacif. Ocean	19 00 S.	141 6 E.	
Winchelſea	Eu.	England	Eng. Channel	50 58 N.	0 50 E.	0 45
Wintertoneſe	Eu.	England	Germ. Ocean	53 02 N.	1 22 E.	9 00
Wiſbuy in I. Gotland	Eu.	Sweden	Baltic Sea	57 40 N.	19 50 E.	
C. Wrath	Eu.	Scotland	Weſt ocean.	58 40 N.	4 50 W.	
Wybourg	Eu.	Finland	G. Finland	60 55 N.	30 20 E.	
Y						
Yambo	Aſia	Arabia	Red Sea	24 25 N.	38 54 E.	
Yarmouth	Eu.	England	Germ. Ocean	52 55 N.	1 40 E.	9 45
Yas de Amber	Africa	Zanguebar	Indian Ocean	0 00	47 15 E.	
Yellow River	Aſia	China	Pacif. Ocean	34 06 N.	120 10 E.	
Ylo	Am.	Peru	Pacif. Ocean	17 36 S.	71 08 W.	
Cape York	Aſia	N. Holland	Endeavour St.	10 41 S.	141 39 E.	
York Fort	Am.	New Wales	Hudſon's Bay	57 02 N.	92 47 W.	9 16
York, New	Am.	New England	Atl. Ocean	40 41 N.	74 04 W.	3 0
Youghall	Eu.	Ireland	St. Geo. Ch.	51 46 N.	8 06 W.	4 30
Z						
Zacatula	Am.	Mexico	Pacif. Ocean	17 10 N.	105 00 W.	
Zachee	Am.	Antilles	Atl. Ocean	18 24 N.	67 52 W.	
I. Zant	Eu.	Italy	Adriatic Sea	37 50 N.	21 30 E.	
I. Zanzebar	Africa	Zanguebar	Indian Ocean	6 55 S.	40 10 E.	
Zaro	Eu.	Dalmatia	Medit. Sea	44 15 N.	16 55 E.	
N. Zealand N.W. point	Aſia	——	Pacif. Ocean	34 28 S.	172 44 E.	
N. Zealand S. point				47 20 S.	167 50 E.	
Zenan City	Aſia	Arabia	Inland	16 20 N.	47 44 E.	
Zuric Sea	Eu.	D. Neth.	Germ. Ocean			3 00

Beſides the times of high-water in the preceding table, the following times ſerve for coaſts of conſiderable extent, and will ſerve nearly for the places on thoſe coaſts.

Finmark, or NNW. coaſt of Lapland, 1h. 30m. Jutland Iſles 0h. 0m.

Frieſland coaſt 7h. 30m. Zealand coaſt 1h. 30m.

Flanders coaſt 0h. 0m. Picardy and Normandy coaſts 10h. 30m.

Biſcay, Gallician, and Portugal coaſts 3h 0m.

Iriſh W. coaſt 3h. 0m. Iriſh S coaſt 5h. 15m.

Africa W. coaſt 3h. 0m. America W. coaſt 3h. 0m.

America E. coaſt 4h. 30m.

FINIS.